AVISTA CORP.
RESPONSE TO REQUEST FOR INFORMATION

JURISDICTION:	WASHINGTON	DATE PREPARED:	06/14/2015
CASE NO.:	UE-150204 & UG-150205	WITNESS:	Don Kopczynski
REQUESTER:	Public Counsel/Energy Project	RESPONDER:	Linda Gervais
TYPE:	Data Request	DEPT:	State & Federal Regulation
REQUEST NO.:	PC/EP – 001	TELEPHONE:	(509) 495-4975
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REQUEST:

Provide any analysis of the costs, benefits, performance of the technology, and/or customer participation and results done by the Company for internal purposes concerning the smart grid demonstration project conducted in Pullman, WA since its inception. In your response, include any internal reports and documents relating to the operation and implementation of the smart grid demonstration project in Pullman, WA provided to senior managers and above since the inception of the pilot.

RESPONSE:

Please also see Avista's response to PC/EP_001C which is **Confidential per Protective Order in UTC Dockets UE-150204 and UG-150205**.

Avista's Smart Grid Demonstration Project in Pullman, WA, was an integrated part of the Pacific Northwest Smart Grid Demonstration Project that was funded, in part, by the U.S. Department of Energy (DOE) and was managed by Battelle Memorial Institute, Pacific Northwest Division (Battelle). The demonstration project covered the period 2010 through early 2015, and included a one-half year design phase, two-year construction phase, two-year observation phase, and a one-half year closeout phase. The objectives of the Pullman Smart Grid project included the following:

1. **Increased system efficiency:** To install and test the performance of measures designed to achieve energy savings through Conservation Voltage Reduction (CVR). In the past, these savings were estimated based on engineering assumptions, but with the new system, we were able to measure increments of energy savings based on a lower voltage set point within the Company's tariffed voltage range.[1]/[2]
2. **Increased operational efficiency:** Notification of power outage on our system from both the transformer and the advanced meter allowed the Company to estimate the improvement in restoration efficiency enabled by this new system.
3. **Greater system reliability and decreased restoration times:** To use a new Distribution Management System to minimize the effect of an outage by remotely monitoring the current on a feeder, determining the location of an outage, isolating the outage, and automatically switching the system to minimize the customers affected by the outage.
4. **Lower consumer energy usage through customer participation:** The advanced meters were used to provide interval data to customers to determine the initial rates of customer adoption and to estimate the energy savings they achieved.

[1] The data collected is important as it related to the Company's energy savings under I-937 in Docket No. UE-111882.
[2] The Company's tariffed voltage range is 114-126.

5. **Automated response of the system to regional needs:** To test the ability and effectiveness of a grid wide system to execute coordinated tools to achieve energy savings and optimization through demand response, distributed generation and storage, and distribution automation.
6. **Incorporation of distributed resources not owned by the utility:** To install and test a system to collect information on the amount and availability of distributed generation resources to call upon during a major outage event.

As part of the Northwest Smart Grid Demonstration Project, Avista was required to provide much of the data it collected during the project to Battelle, for analysis, interpretation, and reporting. The final project reports being developed by Battelle are currently in the drafting and review stage and the Company will supplement this request once the final reports are complete and available.

While Avista played a role in collecting data designed to meet the overarching objectives of the Northwest Project, the Company did use data from the Pullman project in its own studies to meet several of the above objectives. Considerable material documenting the objectives, analysis, and results of these studies have been provided in detail in response to discovery in the Company's 2012 General Rate Case in Docket Nos. UE-120436 and UG-120437. These materials are provided as PC/EP_DR_001 Attachment A and PC/EP_DR_001C Confidential Attachment A. Due to the size of the responses from the 2012 case, they are being provided with this response on compact disc (CD).

Pursuant to objective number one, above, the Company implemented and tested the operational performance of a CVR system. The performance of this system was independently evaluated by Navigant Consulting, who determined that it was a cost effective program, and that its performance exceeded its initial design expectations. A copy of the final report prepared by Navigant is provided as PC/EP_DR_001 Attachment B.

Another focus, related to objective number three, above, was to test the performance of a "smart circuits" system designed to automate much of the switching among distribution circuits that is required to quickly restore service to customers during an outage. Avista was pleased with the performance of its system and the results for the reduction in outage duration time, and other reliability indices, are presented in the table below:

Table No. 1

Reliability Improvements	2013	2014	Year to Date 2015	Life to Date
Customer Minutes Saved	271,320	82,016	0	353,336
Customer Sustained Outages Avoided	1,785	2,985	0	4,770
Total Area Customer Outage Minutes	721,027	1,623,079	45,045	2,389,151
Total Area Customer Outages	4,033	18,614	230	22,877
SAIFI Improvement	30.68%	13.82%	0.00%	17.25%
SAIDI Improvement	27.34%	4.81%	0.00%	12.88%

Another area of study for the Company was to evaluate the rates of adoption by customers of the interval energy data provided by advanced metering as a tool to help them reduce their energy use. In addition, the actual energy savings achieved by those customers was also estimated. The report documenting the results

of this investigation, as developed by the independent consultant Freeman, Sullivan and Company, is provided as PC/EP_DR_001 Attachment C.

An additional interest of the Company was to build on its experience with the deployment of automated metering, and in particular, in the evaluation, selection and operation of the systems required for deployment and operation of an advanced metering system. Some of Avista's key learnings include the following:

- Hardware cost estimates: Pullman allowed Avista to understand more about the hardware components that are needed for a modern AMI system, and the costs associated with the system.
- Software cost estimates: The Pullman project provided Avista the opportunity to better understand the software systems required to operate the metering system, and it also provided insight into the complexity of the system integrations required to make a full-scale project successful. This provided the Company greater capability in the planning and budgeting process for these systems.
- Application analysis: Several applications for AMI were explored during the Pullman project, including voltage alarms, outage notifications, data analytics, and remote meter configuration. The project allowed Avista to better understand how the available technology supports these uses, and what features to include in the scoping for AMI system procurement.
- CVR benefits analysis: The Company used results from the project to analyze the incremental benefits AMI could provide to Avista's existing CVR efforts if voltage alarming from the meters was integrated with the distribution management system.
- Remote reconnect benefits: Results from the Pullman deployment provided more confidence in the estimates of the savings that could be expected from the remote service switches in meters.
- System performance knowledge: Lessons learned about the performance of the five-minute interval energy data capability in a real world environment helped validate its feasibility for the Company.

Avista has developed a range of presentations on the Pullman project that have been made to Company employees, mid-level managers, directors and senior executives, as well as its Board of Directors. These presentations are provided as PC/EP_DR_001 Attachment D. Due to the size of the presentations, they are being provided with this response on compact disc (CD).

FREEMAN, SULLIVAN & CO.

A MEMBER OF THE FSC GROUP

Avista Smart Grid Demonstration Project
Study and Analysis of Customer Energy Usage

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1 Executive Summary

Avista has installed advanced metering infrastructure (AMI) meters at roughly 13,000 premises in the Pullman, Washington area. These meters and their associated meter data management system (MDMS) provide five-minute interval data of electricity use and twice-daily (noon and midnight) natural gas interval data to customers on a day-behind basis. This interval data is displayed on an online web portal along with billing analysis tools concerning energy usage and conservation. Timely and convenient provision of energy usage data and informational tools is designed to allow residential customers to monitor their electricity usage, to better understand the cost of their electric consumption patterns and to identify sub-optimal usage patterns such as leaving lights on when no one is home.

The Avista SmartGrid Demonstration Project was designed to assess the impacts of providing energy consumption information based on hourly interval data on Avista's web portal. To assess the impacts of providing interval data to residential customers, a randomized control trial (RCT) was carried out in which half of Avista's residential customers in Pullman (the treatment group) were provided access to hourly electric and twice-daily natural gas interval data and related billing analysis tools in addition to the standard online My Account features. The other half of the Pullman residential customer base (the control group), was given access to the standard monthly usage information that Avista supplies to all of the customers in its service territory.

The SmartGrid Demonstration Project was carried out from April 2012 to April 2013. It included an RCT experimental design as described above– along with survey work, focus groups and statistical analysis of billing information. This evaluation addresses four primary research questions pertaining to the population of Pullman, Washington:

- How much does customer energy use change when customers are able to access day-behind interval data on their gas and electricity consumption through the web?
- How does access to the enhanced information on the website affect customer perceptions of and satisfaction with Avista?
- What behavioral changes do customers make in response to the interval data provided?
- What is the customer experience of the website? How can it be improved?

A summary of the key findings of these four research questions follows.

1.1 Energy Savings Due to Online Interval Data Presentment

Regression models were fit to estimate both average monthly reductions and average monthly percentage reductions in both electricity and natural gas consumption. No models produced evidence of a decrease in electricity consumption. However, the percentage reduction model produced estimates of statistically significant reductions in monthly natural gas consumption. The local average treatment effect estimate is 44%. While this effect is very large, and the impact is significantly different from zero, the estimate is very imprecise. The 95% confidence interval for impacts for customers who accessed the website range from 83% to 5%. So, while these results suggest there may have been an effect of exposure to interval information at the website, it may be quite small and may be a statistical anomaly.

1.2 Customer Perceptions of and Satisfaction With Avista

After a year of exposure to the availability of interval data on the Avista website via My Account, there are no significant differences between the treatment group and control group (who did not have access to interval data via My Account) with respect to customer perceptions of and satisfaction with Avista services:

- 67% of all survey respondents stated in a survey administered at the conclusion of the demonstration pilot that they are likely to take advantage of Avista-sponsored energy efficiency programs;
- 48% of all survey respondents gave Avista top or second-top satisfaction scores on a 10-point scale. Only 3% of respondents replied with scores in the "dissatisfied" portion of the response spectrum; and
- 70% of all respondents feel that saving energy is important to them.

1.3 Behavioral Changes Made in Response to Avista Web Content

For the most part, neither customers who received access to interval data nor those who did not reported making any changes in the way they used electricity on the basis of information presented by the Energy Analyzer feature; 65% of exit survey respondents reported that they did not or were not sure if the Energy Analyzer inspired any changes in how they use electricity.

There is similarly no evidence offered by the initial and final surveys to suggest that common actions that customers can take to save energy were more likely to be taken by those who had access to interval data. During the course of the demonstration project, significantly more customers reported taking the following actions in the exit survey than the initial survey, but these increases in energy efficient activity and investment were consistent across treatment and control customers:

- Install weather seals on doors and windows;
- Insulate water pipes;
- Install low-flow water heads;
- Reduce water heater temperature;
- Replace incandescent lights with compact fluorescents; and
- Install insulation in walls or ceilings.

1.4 Avista Website Customer Experience

On average, 68% of survey respondents reported visiting the Avista website at least on a monthly basis, but the stated frequency of customer access to the website remained unchanged between the start and end of the demonstration project.

The initial and final surveys revealed that a wide variety of features found on the Avista website became significantly more widely used by the end of the project. Reported incidence of the usage of these features significantly increased across both treatment and control participants between the initial and final surveys for all features except the bill pay feature; the bill pay feature is used by 80% of respondents, on average, and remained steady throughout the course of the study.

There was no significant change in the proportion of customers who rated the website "Extremely Useful" or "Somewhat Useful" before the demonstration project began compared with the same ratings after the project ended. However, the proportion of customers who gave either of these ratings is extremely high – on average 98%.

However, an average of 50% of respondents gave the features of the website an "Extremely Useful" or "Somewhat Useful" rating with respect to how well the website helps the customer control energy costs.

Focus group discussions suggest that the current website has several serious design flaws that undermine its usefulness for informing and educating customers about energy use in their household. They are:

- The energy use-related information is not intuitively located on the landing page. As a result, very few customers were exposed to the interval usage information made available by Avista's advanced meters, undermining the experiment. The tile where the advanced meter-based usage information can be accessed appears to many users as a marketing crawl, much like those found on the right-hand side of Yahoo!, Google and other commercial websites. Others thought the smart meter tile content was actually about the meter installation program. No one reported understanding that the tile contained smart meter data.
- Customers only reported using the Energy Analyzer once or twice before determining there was no useful information there and subsequently ignoring it. They did not comprehend the underlying logic of the tool, and thus did not understand the necessary order to properly experience the Energy Analyzer.
- Most customers have no motivation for accessing the information and tools provided on the website and find the information provided on the website to be of little use. It is not that some are not hungry for information about their energy use; it is that they are not hungry for the kind of information currently provided. Consequently, most customers do no consult the energy use information on the website more than once. Part of the problem is that they really have no need for most of the information that is provided.

2 Introduction

Avista has installed advanced metering infrastructure (AMI) meters at roughly 13,000 premises in the Pullman, Washington area. These meters and their associated meter data management system (MDMS) provide five-minute interval data of electricity use and twice-daily natural gas smart meter interval data to customers on a day-behind basis. This interval data is displayed on an online web portal along with billing analysis tools concerning energy usage and conservation. Timely and convenient provision of energy usage data and informational tools is designed to allow residential customers to monitor their electricity usage, to better understand the cost of their electric consumption patterns and to identify sub-optimal usage patterns such as leaving lights on when no one is home.

With increasing numbers of AMI investment projects underway across North America, further investments in tools for customer facing presentment of usage data developed by third party providers such as Aclara are following in their wake. The development of web presentment tools is a compelling utility initiative that can add value to the customer and enhance customer satisfaction while at the same time leverage the new stream of interval customer-specific usage information made available by the AMI system. Research to date suggests that frequent information feedback on energy usage may lead to population-wide reductions in energy use in the range of 1-3%.[1] Other important and open questions surrounding these projects are concerned with whether customers value energy usage information, how best to present it and what behavioral changes customers might make in response to that information.

The Avista SmartGrid Demonstration Project was designed to assess the impacts of providing energy consumption information based on hourly interval data on Avista's web portal. To assess the impacts of providing interval data to residential customers, a randomized control trial (RCT) was carried out in which half of Avista's residential customers in Pullman, Washington (the treatment group) were provided access to hourly electric and twice-daily natural gas interval data and related billing analysis tools in addition to the standard online My Account features. The other half of the Pullman residential customer base (the control group), was given access to the standard monthly usage information that Avista supplies to all of the customers in its service territory.

2.1 Evaluation Goals and Objectives

Avista's SmartGrid Demonstration Project was carried out from April 2012 to April 2013. It included an RCT experimental design, as described above, along with survey work, focus groups and statistical analysis of billing information. This evaluation addresses four primary research questions pertaining to the population of Pullman, Washington:

- How much does customer energy use change when customers are able to access day-behind interval data on their gas and electricity consumption through the web?
- How does access to the enhanced information on the website affect customer perceptions of and satisfaction with Avista?
- What behavioral changes do customers make in response to the interval data provided?
- What is the customer experience of the website? How can it be improved?

[1] Allcott, Hunt (2011). "Social Norms and Energy Conservation." Journal of Public Economics.

2.2 Report Overview

The remainder of this report is organized as follows. Section 3 presents the project's experimental design and the implementation of that design. Section 4 describes and summarizes the data sources made available for statistical analysis. Section 5 follows with the results of the energy savings analysis. Section 6 presents results from both the initial and final customer surveys. Section 7 concludes this report with the findings from two customer focus group discussion sessions.

3 Experimental Design and Implementation

The experimental design used in this study was a randomized controlled trial (RCT) in which half of Avista's residential customers in Pullman, Washington were given website access to personal hourly interval data on electricity consumption and twice-daily interval data on gas consumption. All customers in Pullman already had access to an Aclara-based Avista web portal that included a suite of energy use and billing analysis tools based on monthly interval usage data.

Customer access to the web portal was contingent on the customer signing up for My Account – Avista's online account program – a service that requires internet access. Any customer with an active Avista account and internet access could sign up for My Account with their account number, meter number and an email address. Prior to the beginning of the treatment, Avista undertook a marketing effort designed to increase My Account penetration among the entire Pullman population.

The population sampled was the entire population of Pullman with advanced meters. Assignment to experimental conditions was performed at the address level so that any multi-meter addresses would have all of their meters in the same group.

Beginning in April 2012, the treatment group was granted access to the additional set of tools on the Avista website. One month prior to the rollout of the new functionality, treatment customers specifically were exposed to a marketing program that announced the arrival of the new web portal.[2] Treatment customers alone were exposed to the treatment for a year, until April 2013, when the control group was also granted access to the web portal. As part of normal billing operations, monthly usage data was collected for both the treatment and control groups over the course of the treatment period. As described later in Sections 4 and 5, this data was used to estimate the effect of the treatment, isolated from all other variables that affect energy usage.

3.1 Statistical Power of the Experiment

Prior to carrying out the experiment, FSC simulated the outcome of the RCT using two years of historical load data to produce estimates of the RCT's ability to estimate the load impact effect of the treatment accurately to within desired levels of precision. It was determined that the evaluation would have the power to measure an energy savings of approximately 2%, averaged over the entire treatment group. The confidence intervals associated with 2% average energy savings are shown for varying levels of confidence in Table 3-1. The confidence intervals indicate the likely range of estimated effect size for electricity usage. Table 3-1 indicates that if the true effect of the treatment on the entire treatment group (including those customers who do not view the website) was to induce a 2% change in usage, then there is an 80% chance that the measured coefficient value would be in the interval (1.2%, 2.8%).

[2] Avista made a promotional video available to treatment customers, which can be viewed here: http://player.piksel.com/player.php?p=i4nzvihe

Table 3-1: RCT Confidence Intervals For the Pullman RCT

Confidence Interval	Width +/- (%)	Energy Change Range (%)
80%	0.8	1.2% – 2.8%
90%	1.0	1.0% – 3.0%
95%	1.2	0.8% – 3.2%

3.2 Implementation of the Experiment

After randomization, the treatment group was composed of 5,670 customers and the control group was composed of 5,669 customers. The treatment and control group customers each represent roughly half of Avista's residential customer base in Pullman, Washington. Not all customers assigned to the treatment and control groups had signed up for My Account membership at the time the addresses were assigned to groups. A total of 7,095 of the 11,339 customers (about 63%) were My Account subscribers as of September 22, 2011 – 3,537 in the treatment group and 3,558 in the control group.

Prior to implementation, a known potential problem with the research design was that control group members might complain about the fact that they did not have access to the same web functionality that some of their friends and neighbors had. A three-step plan was implemented to overcome this problem. It was communicated to the Pullman population as a whole that a study was underway that required some customers to be part of the control group. If a customer called to complain, Avista call center staff would first explain that the customer was part of a study and that the customer would have access to full web functionality by April 2013, and then asked the customer if it was permissible to maintain their status as a member of the control group. If, at this point, remaining in the control group was still an unsatisfactory outcome for the customer, they were granted access to the web portal. Only eight customers in the control group gained access to the web portal in the treatment period. This small number of customers in the control group accessing the web portal does not significantly affect the measured conservation effect between the groups.

The magnitude of the effect of the treatment in the RCT depends heavily on the fraction of customers in the treatment group that access the website. By the end of the treatment period, only 282 customers from the treatment group (about 5%) had accessed the enhanced content of the web portal. Considering this fact, the lack of observed change in energy consumption in the treatment group is not surprising.

3.3 Pretreatment Differences

Because subjects were randomly assigned to treatment and control groups there should be no significant differences between them on any observable or unobservable variables prior to the treatment. Differences in unobservable characteristics cannot be observed. However, it is possible to observe the differences in the two groups based on observable variables and it is good practice to check for differences after randomization particularly on pre-test measurements of the dependent variables of interest (i.e., gas and electricity consumption).

No significant differences in population characteristics were found between the treatment and control groups on any observable variables. Table 3-2 shows the results of tests for differences between the treatment and control groups for various characteristics. Differences between the experimental groups with respect to the proportion of customers in multi-family housing, the proportion of customers with My Account membership, the average date on which a customer's account was opened and the average date on which an advanced meter was installed were all very small and not statistically significant.

Table 3-2: Comparison of Population Characteristics for Treatment and Control Groups

Characteristic	Mean		t-statistic	p-value
	Control	Treatment		
Multi-family Housing	0.62	0.62	0.01	0.99
Web Membership	0.63	0.62	0.42	0.67
Account Opening Date	February 4, 2007	March 15, 2007	-0.71	0.48
Meter Installation Date	April 16, 2011	April 16, 2011	-0.18	0.86

There were also no significant differences between treatment and control groups in gas and electricity consumption prior to the experiment. Table 3-3 displays the results of tests for the pretreatment difference in average monthly electric usage between groups. These tests were conducted for 32 billing months during the pretreatment period. A statistically significant difference was observed in one month. Given the significance testing threshold (5%) used in these tests at least one significant result is to be expected for each 20 comparisons. Thus, such a difference could have occurred about twice given the number of tests by chance alone. It is reasonable to dismiss this one significant difference as a statistical anomaly.

It is notable that usage in the control group is slightly but consistently smaller than it is for the treatment group – around 8-10 kWh per month. However, the load impact estimation methodology employs difference-in-differences panel regressions that factor the differences between the control and treatment groups that remain constant over time. Figure 3-1 presents a graphical comparison of average monthly kWh for treatment and control groups during the pretreatment period. Electric use tends to be lower for the control group, especially during the initial months of the academic year, September through December. In general, the usage patterns for both groups follow very similar trends.

Table 3-3: Comparison of Pretreatment Average Electricity Consumption (kWh) for Treatment and Control Groups

Date	Average Monthly kWh		t-statistic	p-value
	Control	Treatment		
2009m8	480.48	484.72	-0.51	0.61
2009m9	533.77	547.20	-1.63	0.10
2009m10	626.44	637.74	-1.35	0.18
2009m11	775.44	787.26	-1.16	0.24
2009m12	954.28	962.00	-0.62	0.54
2010m1	931.52	934.37	-0.22	0.82
2010m2	857.47	864.69	-0.65	0.52
2010m3	835.84	840.48	-0.43	0.67
2010m4	744.35	749.64	-0.54	0.59
2010m5	647.42	656.65	-1.06	0.29
2010m6	497.33	499.42	-0.28	0.78
2010m7	468.59	476.49	-1.00	0.31
2010m8	492.93	494.75	-0.22	0.82
2010m9	544.90	551.07	-0.82	0.41
2010m10	583.77	598.09	-1.87	0.06
2010m11	747.17	758.40	-1.15	0.25
2010m12	1,005.89	1,015.24	-0.73	0.47
2011m1	1,030.04	1,039.43	-0.73	0.47
2011m2	916.14	925.92	-0.83	0.40
2011m3	920.94	927.72	-0.57	0.57
2011m4	906.53	924.20	-1.20	0.23
2011m5	710.67	719.28	-0.77	0.44
2011m6	493.78	500.02	-0.82	0.41
2011m7	303.75	306.75	-0.50	0.62
2011m8	518.58	526.22	-0.98	0.33
2011m9	546.84	557.31	-1.44	0.15
2011m10	665.62	681.95	-2.01	0.04
2011m11	875.84	896.14	-1.87	0.06
2011m12	995.25	1,010.72	-1.24	0.21
2012m1	1,012.13	1,023.92	-0.95	0.34
2012m2	913.18	926.86	-1.19	0.23
2012m3	852.73	868.23	-1.47	0.14

Figure 3-1: Comparison of Pretreatment Average Monthly Electricity Consumption (kWh) for Treatment and Control Groups

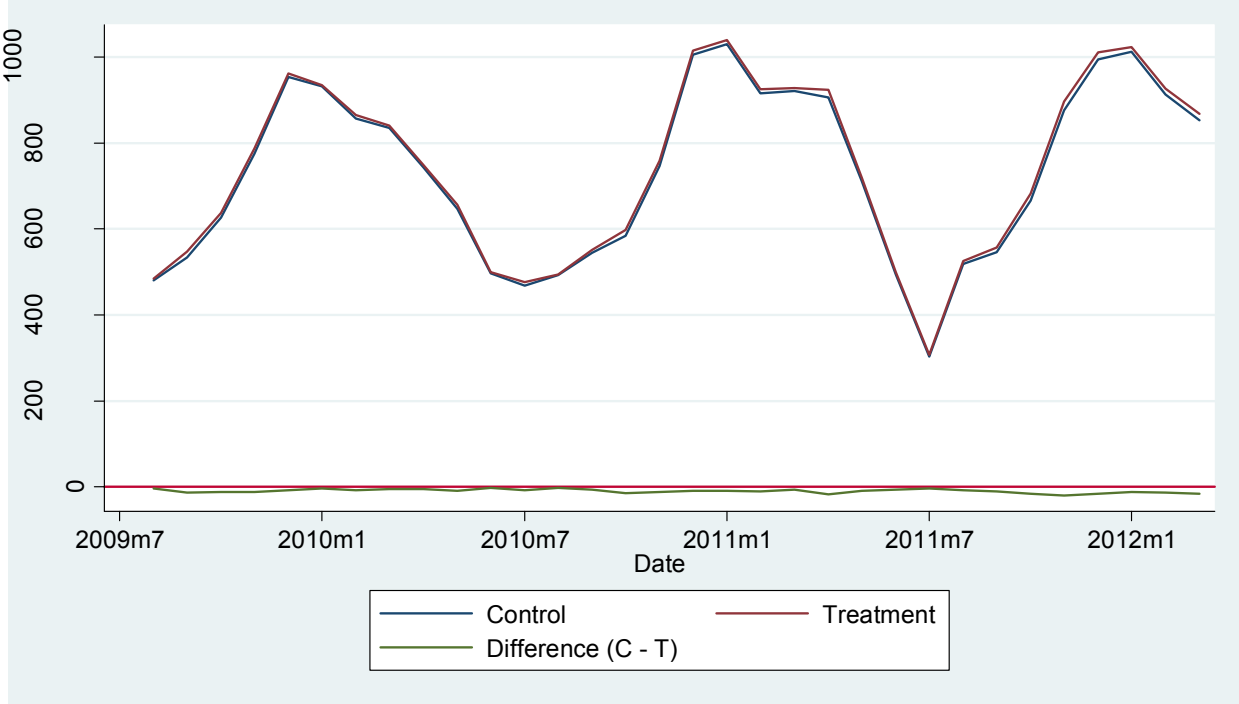
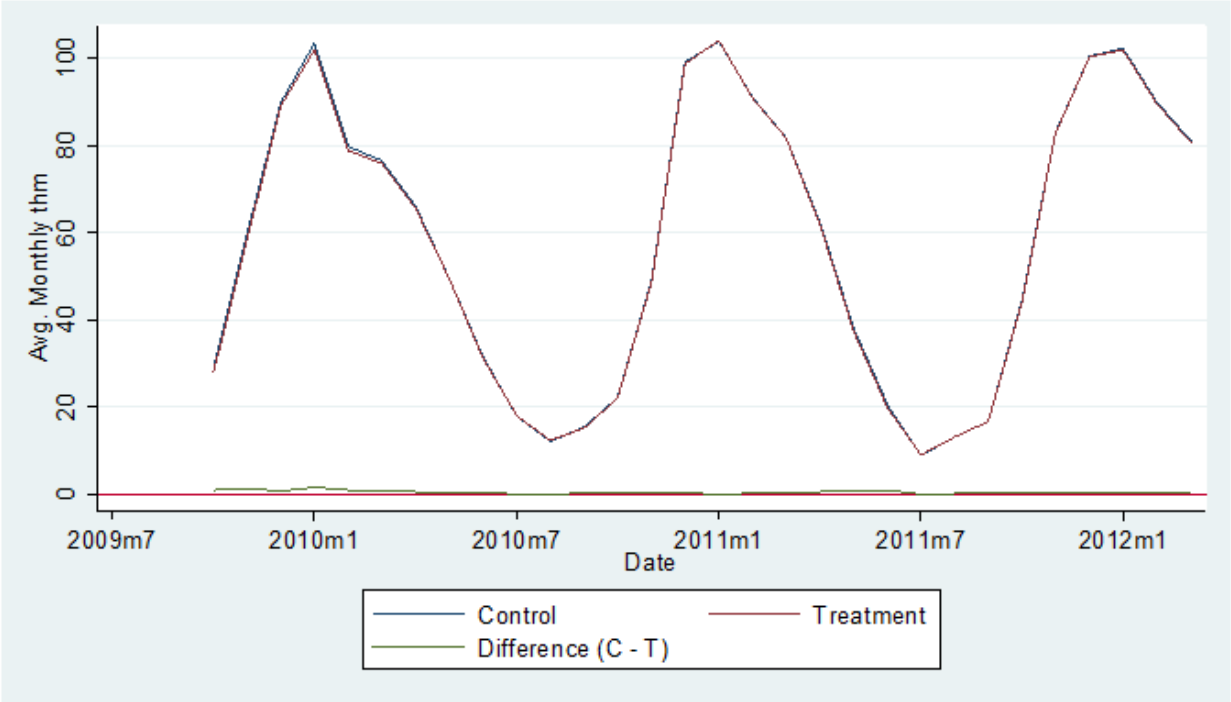


Table 3-4 continues to compare the treatment and control customers on the basis of natural gas consumption during the 30-months prior to the start of the demonstration project. As was the case with electricity consumption, the control group used slightly less natural gas on average than their treatment group counterparts. There are no pretreatment months during which gas consumption of the treatment and control groups differs significantly. The comparability of these randomized groups' usage trends is shown in Figure 3-2. It should be noted that not every treatment and control customer in Pullman receives gas service from Avista. Of the 5,669 control group customers, 2,252 receive gas service, and of the 5,670 treatment group customers, 2,255 receive gas service.

Table 3-4: Comparison of Pretreatment Average Monthly Gas Consumption (therms) for Treatment and Control Groups

Date	Average Monthly Therms		t-statistic	p-value
	Control	Treatment		
2009m10	28.93	28.06	1.03	0.30
2009m11	59.71	58.47	0.99	0.32
2009m12	89.88	89.23	0.37	0.71
2010m1	103.54	101.97	0.85	0.40
2010m2	79.74	78.88	0.59	0.55
2010m3	76.53	75.91	0.44	0.66
2010m4	66.07	65.55	0.41	0.68
2010m5	49.27	49.26	0.01	0.99
2010m6	31.49	31.12	0.50	0.62
2010m7	17.82	17.89	-0.13	0.90
2010m8	11.99	12.36	-0.77	0.44
2010m9	15.39	15.11	0.58	0.56
2010m10	22.06	21.97	0.14	0.89
2010m11	48.94	48.70	0.22	0.83
2010m12	99.13	98.73	0.23	0.82
2011m1	103.87	104.04	-0.10	0.92
2011m2	91.12	90.87	0.16	0.87
2011m3	81.82	81.70	0.08	0.94
2011m4	62.17	61.64	0.46	0.64
2011m5	38.09	37.37	0.94	0.35
2011m6	20.55	19.70	1.58	0.11
2011m7	8.81	8.89	-0.23	0.82
2011m8	13.14	13.09	0.10	0.92
2011m9	16.67	16.62	0.08	0.94
2011m10	44.71	44.18	0.60	0.55
2011m11	82.94	82.87	0.05	0.96
2011m12	100.49	100.37	0.07	0.94
2012m1	102.33	101.88	0.27	0.79
2012m2	90.01	89.63	0.25	0.80
2012m3	81.08	80.73	0.25	0.80

Figure 3-2: Comparison of Pretreatment Average Monthly Gas Consumption (therms) for Treatment and Control Groups



4 Web Portal Usage

A customer population file with web membership information last updated on September 22, 2011 was used to determine whether a customer had My Account membership or not. Login data on web portal access was made available through Aclara, the web portal provider, for the period after April 2012. Table 4-1 shows the number of customers in the treatment and control groups as well as the number in each group that had My Account membership, and the number that used the web portal during the study period. Note that eight customers assigned to the treatment group managed to obtain access to the enhanced content despite their assignment to the control group. It is likely that these customers were made aware of the enhanced content through a friend or relative and contacted Avista to request access to it.

Table 4-1: Number of Customers by Group

Group	All	My Account	Enhanced Web Content User
Treatment	5,670	3,537	282
Control	5,669	3,558	8
Total	**11,339**	**7,095**	**290**

Aclara extracted login data on web portal access that allowed FSC to analyze how customers in each experimental group use the portal and how use of the portal changes over time. Aclara also provided data on page views by page type within the web portal; however, this is only available for March 2013 to June 2013 and so was insufficient to use for meaningful analysis.

Table 4-2 shows total logins to the enhanced web content, the number and percent of customers that ever accessed it, and the number of logins per customer that accessed the enhanced content for both treatment and control groups. These results are tabulated for the study period of the demonstration project, April 2012 through March 2013. The key takeaway of Table 4-2 is that only 5% of customers in the treatment group ever viewed the content of interest on the Avista website.

Table 4-2: Total Use of Enhanced Website Content by Group

Group	Logins	Customers	% Customers in Group	Logins per Customer
Control	15	8	0.14	1.88
Treatment	766	282	4.97	2.72
Total	781	290	2.56	2.69

Web portal access data for the period from April 2012 to June 2013 was used to calculate the summary statistics that follow – no web portal data was available for the period from July 2012 to August 2012.

Table 4-3 shows logins to the enhanced content, the number of customers that accessed it, and the number of logins per customer that accessed the enhanced content for each month of the study and

post-study periods for the treatment and control groups. Very few control group customers accessed the web portal data before April 2013, as expected since as a whole, the control group was not granted access to the portal content until that time. The number of treatment customers per month that accessed the web portal was highest in April 2012, the first month of the study period. It declined significantly in the following month and didn't rise again until the fall when Washington State University students returned from summer vacation. Pullman is a college town and it's likely that many Pullman customers were away during these months when the school year was in transition. From October 2012 to February 2013, the number of treatment group customers per month that accessed the web portal remained above 40, and the number of logins per customer tended to be higher than it was during the initial months of the study. In subsequent months, while logins per customer mostly remained around 1.75, the number of customers that accessed the web portal per month dwindled to around 20. When customers in the control group were granted access to the web portal in April, the number of customers accessing the web portal was higher than in the treatment group, but logins per customer was lower than that of the treatment group for the same period.

Table 4-3: Use of Enhanced Content by Month and by Group

Date	Logins		Customers		Logins per Customer	
	Control	Treatment	Control	Treatment	Control	Treatment
2012m4	0	193	0	136	NAN	1.42
2012m5	0	55	0	40	NAN	1.38
2012m6	0	26	0	22	NAN	1.18
2012m7	-	-	-	-	-	-
2012m8	-	-	-	-	-	-
2012m9	1	41	1	21	1.00	1.95
2012m10	1	66	1	44	1.00	1.50
2012m11	2	69	2	50	1.00	1.38
2012m12	5	84	4	43	1.25	1.95
2013m1	3	63	1	45	3.00	1.40
2013m2	2	69	1	40	2.00	1.73
2013m3	1	23	1	20	1.00	1.15
2013m4	39	53	29	29	1.34	1.83
2013m5	20	36	19	19	1.05	1.89
2013m6	6	32	5	19	1.20	1.68
Total	80	810	64	528	1.25	1.53

Table 4-4 compares total views of the enhanced content to views of new users only, by month. Among treatment customers, the large majority of views of the enhanced content in April 2012 was by new users, in subsequent months, however, the majority (approximately 70%) of views were associated with return users. Once the content was made available to all residential Pullman customers, the same high percentage (70% and more) of views were made by new control users.

Table 4-4: Use of Enhanced Content by Month and by Group

Month	Page Views		New User Page Views		Percent New User Page Views	
	Control	Treatment	Control	Treatment	Control	Treatment
2012m4	0	193	0	136	NAN	70%
2012m5	0	55	0	16	NAN	29%
2012m6	0	26	0	11	NAN	42%
2012m7	-	-	-	-	-	-
2012m8	-	-	-	-	-	-
2012m9	1	41	1	14	100%	34%
2012m10	1	66	1	26	100%	39%
2012m11	2	69	1	25	50%	36%
2012m12	5	84	3	18	60%	21%
2013m1	3	63	1	15	33%	24%
2013m2	2	69	1	12	50%	17%
2013m3	1	23	0	9	0%	39%
2013m4	39	53	29	14	74%	26%
2013m5	20	36	14	3	70%	8%
2013m6	6	32	5	2	83%	6%

Figure 4-1 shows a histogram of the distribution of logins to the enhanced web content per customer in the treatment group, among all those that accessed it. Most treatment customers accessed the web portal only once, but a few users accessed it more than 20 or 30 times. Table 4-5 presents the average amount of time spent in the enhanced content portion of the Avista site for treatment customers only, which can be seen to peak during the fall back-to-school months. Fifty out of the approximately 950 (5%) observations in this dataset indicated more than 2-hours of time spent viewing the enhanced content and so were excluded from analysis as outliers. Generally, treatment customers spent less than 10-minutes viewing or using the enhanced content.

Figure 4-1: Histogram of Logins Per Treatment Customer
(bin width = 1 login per customer)

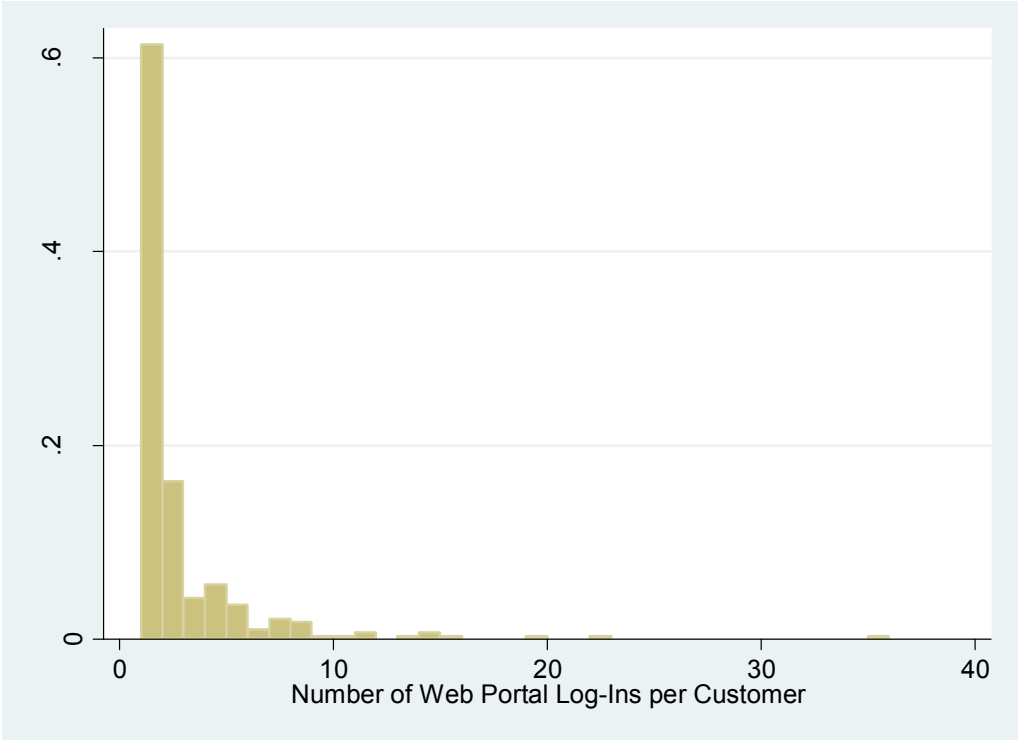


Table 4-5: Average Time Spent on Enhanced Content per Login – Treatment Customers

Month	Average Time Spend in Enhanced Content per Login
2012m4	0:06:17
2012m5	0:04:48
2012m6	0:04:05
2012m7	-
2012m8	-
2012m9	0:10:34
2012m10	0:08:07
2012m11	0:06:47
2012m12	0:05:57
2013m1	0:05:24
2013m2	0:07:39
2013m3	0:06:21
2013m4	0:07:25
2013m5	0:04:01
2013m6	0:04:11

5 Energy Savings Analysis

This section first describes the methodology used to estimate monthly kilowatt-hours (kWh) and monthly therms of natural gas saved due to exposure to the enhanced web portal. Following that, graphical results are presented that demonstrate that the effect of exposure to the load analysis web portal is small. Regression results are then presented that represent an average treatment effect (ATE) estimate of the effect of the treatment on all individuals exposed to the web portal, and a local average treatment effect (LATE) estimate of the effect of the treatment on individuals that used the web portal. This section concludes with a discussion of implications of this analysis.

5.1 Methodology

Load impacts were estimated using difference-in-differences panel regressions, a method that makes use of pretreatment and post-treatment data for both the treatment and control groups. The impact estimates equal the difference between loads in the treatment and control groups during the treatment period minus the difference between loads in the treatment and control groups during the pretreatment period. This method controls for variables that are constant over time but vary by group and variables that vary over time but are constant by group. An example of the former is building size, which is constant over time but may differ on average between groups, while an example of the latter is weather that is constant across the groups but varies over time. Impact estimates are calculated with standard errors that correctly account for the correlation in customer loads over time.

The regression specification underlying all the treatment effect estimates reported is the following:

$$load_{it} = \alpha + \gamma_i + \rho D_{it} + \lambda_t + \varepsilon_{it}$$

Where α is the intercept, λ_t is a time varying effect, γ_i is an individual fixed effect for each subject, D_{it} is a binary variable indicating treatment status, ε_{it} is an error term, $load_{it}$ is the dependent variable that gives kWh or BTU for individual i at month t. The coefficient of interest is ρ, which gives the causal effect of exposure to the web portal on monthly usage. The crucial identification assumption for difference-in-differences panel regressions is that there were no factors that affected the treatment group and the control group differentially that also varied over time. Put another way, the counterfactual trend in energy use of the treatment group that would be observed were the treatment never imposed, is assumed to be parallel to the observed trend for the control group following the treatment.

FSC also estimated load impacts for customers who accessed the enhanced web portal. In this case, the parameter of interest is ρ, scaled up by the proportion of treatment individuals that accessed the web portal. This estimate is the local average treatment effect (LATE), and gives the average causal effect of web portal use on monthly usage for those who would use the web portal were it offered. The LATE estimate is unbiased if the treatment satisfied an exclusion restriction, an additional assumption that requires that customers in the treatment group who did not view the web portal were otherwise unaffected by the treatment. Correct standard errors are produced for the LATE estimates by scaling up the standard errors of the ATE estimates by the same factor used to scale the estimates – the proportion of treatment customers that accessed the web portal.

5.2 Graphical Results

Figure 5-1 graphically demonstrates the primary results of the analysis of monthly electric consumption of the treatment and control customers of the demonstration project. The graph shows electric consumption (kWh) savings for the whole treatment population. The vertical line marks April 2012, the first month in the treatment period. The green profile near 0 at the bottom of the graph shows the difference between the treatment and control groups.

It is evident in Figure 5-1 that there is no discernible difference between the difference in kWh across groups in the pretreatment period and the difference in kWh across groups in the treatment period.

Figure 5-1: Comparison of Average Monthly kWh by Group

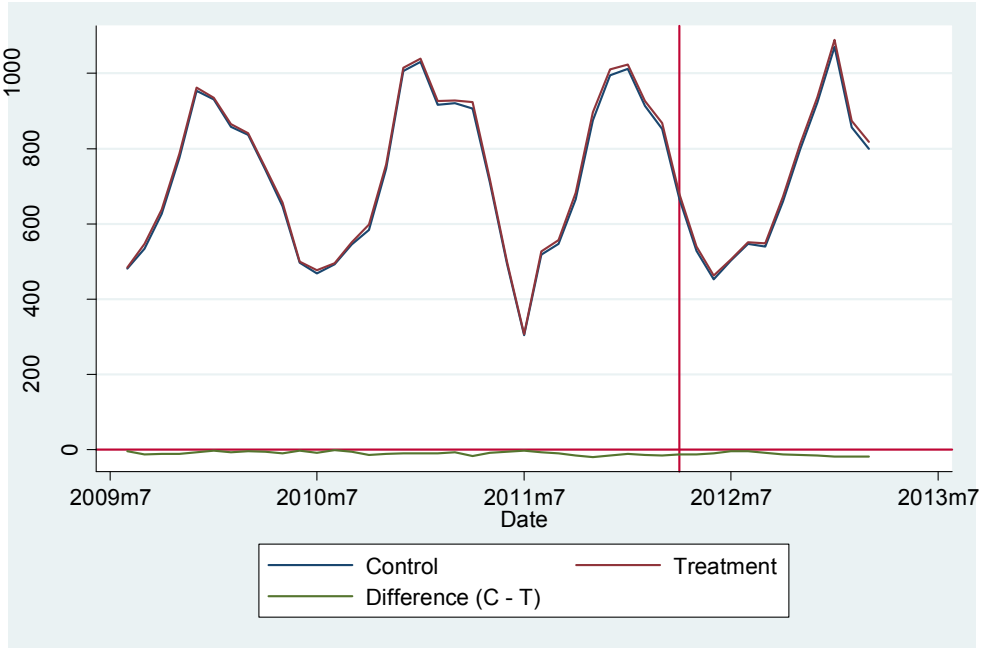
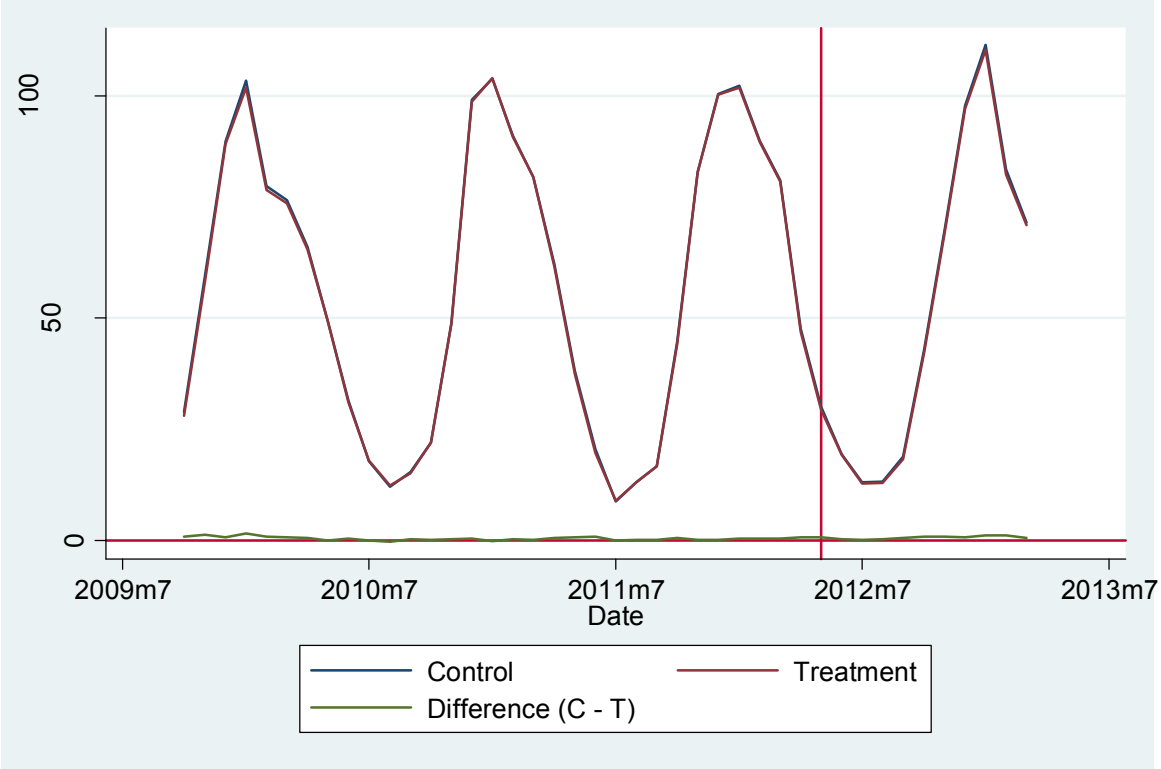


Figure 5-2 shows gas consumption for treatment and control customers of the demonstration project. Again, there is no discernible difference in consumption between the treatment and control groups.

Figure 5-2: Comparison of Average Monthly Gas Usage (therms) by Group



5.2 Regression Results

Regressions were used to produce a single numerical estimate of the treatment effect for the treatment group on both electricity and natural gas consumption. This average treatment effect estimate was then scaled up by the proportion of the treatment customers that used the web portal to produce an estimate of the local average treatment effect for web portal users. The estimates were calculated using a dataset of monthly usage measured at the individual customer level for August 2009 through and including March 2013. Effects were estimated both in terms of usage (kWh and thm) and in terms of percentage of usage.

The analysis dataset includes usage data for the entire treatment and control populations. The entire treatment and control populations have 5,920 and 5,909 customers, respectively. Of the 5,920 customers that were offered the treatment, 282 accessed the web portal during the treatment period. Hence, the proportion of customers that accessed the web portal is .048, and this proportion is used to scale the average treatment effect.

A customer was defined as receiving the treatment if they were assigned to the treatment group, and the date of the usage data was after March 2012. A customer was defined as a web portal user if they viewed the web portal in the treatment period. These customers are also referred to as compliers. Non-compliers are customers that did not view the web portal in the treatment period.

5.2.1 Electricity Consumption Impacts

Table 5-1 shows the estimated impact on electricity consumption by the treatment group of providing access to the interval usage data on the website. P-values for the coefficient estimates from the regression models are displayed as well. For the kWh model, the coefficient estimates are interpreted as the average monthly difference due to the treatment between the treatment group and the control group in terms of actual kWh. For example, the estimated coefficient for all customers with access to the web portal (Table 5-1) shows that treated customers, on average, used 3.84 kWh more per month than they would have if they had not had access to the web portal. For the percentage model, the coefficients can be interpreted as percentages divided by 100. For example, the estimated coefficient for all customers with access to the web portal (Table 5-1) suggests that those customers use, on average, .3% more electricity per month after having access to the web portal than they would if they had not had access to the web portal.

It is important to note that all regression estimates in Table 5-1 are not significantly different from zero (statistically), so rather than conclude that access to the web portal increases electricity consumption it is more appropriate to conclude that the web portal had no effect on monthly average electricity consumption.

Table 5-1: Regression Estimates of the Effect of Web Portal Exposure on Electric Consumption for All Sample Customers

Treatment	Model							
	kWh				Percentage			
	Coeff.	P-value (%)	[95% Conf. Interval]		Coeff.	P-value(%)	[95% Conf. Interval]	
Access to web portal	3.84	0.32	-3.68	11.37	0.003	0.64	-0.01	0.02

Table 5-2 shows the local average treatment effect estimates for customers that used the enhanced web portal. Of particular note is the imprecision of the estimates. While the point estimates are positive, the confidence interval includes negative effects, and so reductions in consumption cannot be ruled out with 90% confidence.

Table 5-2: Scaled Regression Estimates of the Effect of Web Portal Use on Electric Consumption for Web Portal Users

Treatment	Model					
	kWh			Percentage		
	Coeff.	[95% Conf. Interval]		Coeff.	[95% Conf. Interval]	
Used Web Portal	80.61	-77.26	238.66	0.06	-0.21	0.34

5.2.2 Gas Consumption Impacts

Table 5-3 presents the estimated average impacts on natural gas consumption, both on a usage (therms) and percentage basis. The analysis dataset, treatment variable definition and model specification are the same as those used in the electric usage estimation process, except that the natural gas usage data made available begins in October 2009 rather than August 2009. The data is also limited to customers that receive gas service: of the 5,669 control group customers, 2,252 receive gas service, and of the 5,760 treatment group customers, 2,255 receive gas service. Notably, the percentage model produces very small, but measureable, changes in gas consumption of approximately -1.8% per month.

Table 5-3: Regression Estimates of the Effect of Web Portal Exposure on Gas Consumption for All Sample Customers

Treatment	Model							
	Therms				Percentage			
	Coeff.	P-value (%)	[95% Conf. Interval]		Coeff.	P-value(%)	[95% Conf. Interval]	
Access to web portal	-0.36	0.30	-1.04	0.32	-0.018	0.03	-0.035	-0.002

Table 5-4 presents a comparison of the therms; the percentage model estimates are shown in Table 5-3. Mean monthly usage data is calculated for control customers and the impact from the therms model is used to create a percent impact, which in turn is compared to the percentage model.

Table 5-4: Comparison of Linear and Logarithmic Regression Estimates

Mean Monthly Usage (therms)	Linear Impact Coefficient	Percent Impact Using Linear Estimate	Log Impact Coefficient	Percent Impact Using Log Estimate
56.15	-0.36	-0.64	-0.018*	-1.84

Of the 2,255 treatment customers that receive gas service, 95 used the enhanced web portal. Hence, the proportion of web portal users among gas customers in the treatment group is 0.042, and this proportion is used to scale up the average treatment effect estimates and confidence intervals to produce local average treatment effects for web portal users. The local average treatment effect estimates are shown in Table 5-5. The average percent decrease in usage for gas customers that used the web portal is 44%. While this effect is very large, and the impact is significantly different from zero, the estimate is very imprecise. The 95% confidence interval for impacts for customers who accessed the website range from 83% to 5%. So, while these results suggest there may have been an effect of exposure to interval information at the website it may be quite small and may be a statistical anomaly.

Table 5-5: Scaled Regression Estimates of the Effect of Web Portal Use on Gas Consumption for Web Portal Users

Treatment	Model					
	Therms			Percentage		
	Coeff.	[95% Conf. Interval]		Coeff.	[95% Conf. Interval]	
Used Web Portal	-8.51	-24.64	7.62	-0.44	-0.83	-0.05

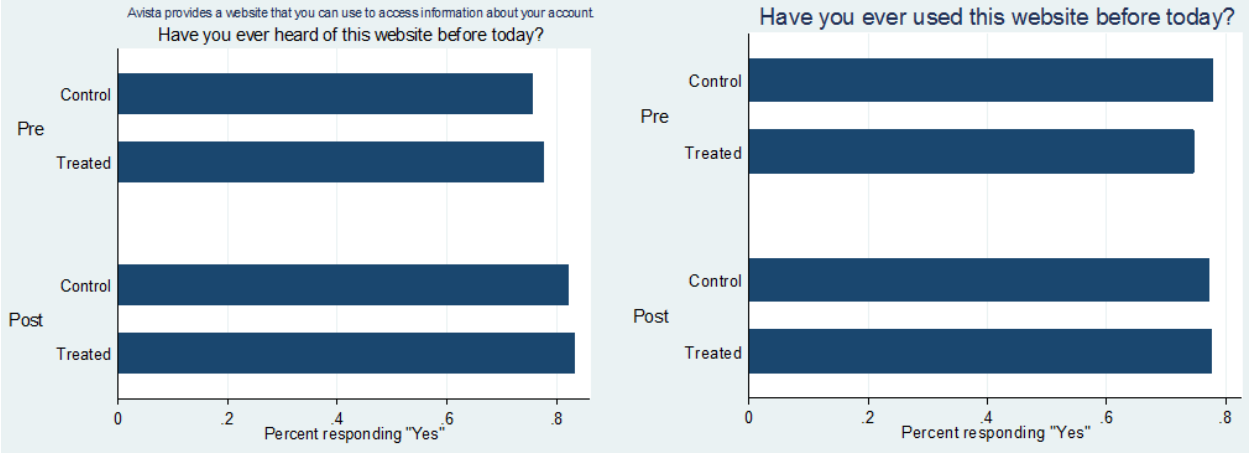
6 Customer Survey Findings

Two surveys were sent to Avista's Pullman residential customer base to assess household behaviors impacting energy usage. The initial survey was administered on October 7, 2011. Invitations were sent to 2,000 randomly selected customers, 1,000 from each group. In total, 1,055 customers responded, yielding a 53% response rate. Most of the surveys (74%) were completed online, with the remainder completed on paper and returned to FSC by U.S. Mail. Control group members returned 511 (48%) surveys and treatment group members completed 544 (52%) surveys. The final survey was administered on April 9, 2012 using the same contact protocol as was used for the initial survey. Invitations to the online survey were sent to 2,000 randomly selected customers from both treatment and control groups. In total, 1,006 customers responded, yielding a 50% response rate. The majority (84%) of the surveys were completed online, with the remainder completed on paper and returned to FSC by U.S. Mail. Control group members returned 494 (49%) surveys and treatment group members completed 512 (51%).

The final survey included some of the same questions that appeared in the initial survey. These questions that were common to both surveys can be compared on a difference-in-differences basis that measure changes in responses between treatment and control customers before and after the treatment that are exogenous to the treatment itself. The comparative analysis of these questions is presented in this section. Responses to the remaining questions of the initial survey that did not also appear in the final survey are summarized in Appendix A. The remainder of the questions in the final survey were unique to the later survey and concerned the level of customers' engagement with Avista, opinions about saving energy, willingness to make changes to control energy consumption and overall satisfaction with Avista services. The responses to these questions are summarized in Appendix B.

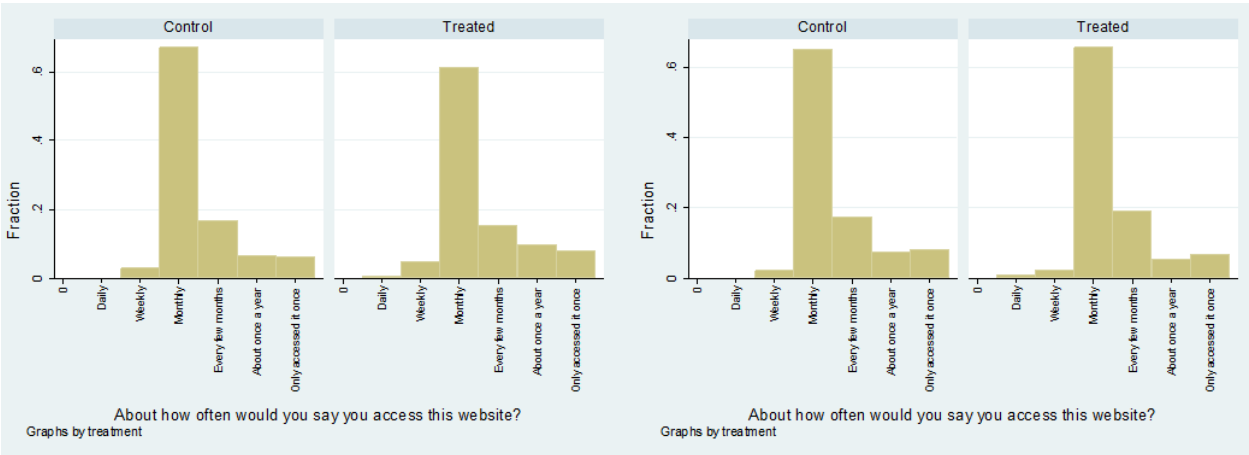
Both the initial and final surveys opened with screening questions asking about whether the respondent has heard of the Avista website, and if so whether they have ever used the website before the day the survey was taken; responses to these questions are summarized in Figure 6-1. About 75% of respondents reported awareness of the website in the initial survey, and by the time of the final survey, awareness of the website increased to over 80%. This increase is statistically significant. Among those customers who reported knowing about the website, on average, 77% of them reported visiting it. There is no significant change in the percentage of respondents who have visited the website as reported at the time of the initial survey compared to those at the time of the final survey – neither treatment nor control customers are more likely to have visited the website by the end of the study.

Figure 6-1: Website Recognition and Use by Treatment and Control, Pre and Post-treatment



Those customers who had responded that they have visited the Avista website were asked how often they think they visit it. Summaries of responses to these reports of frequency of website access are presented in Figure 6-2. The difference between treatment and control groups was not statistically significant; in the initial survey, 70% of control respondents and 67% of treatment customers reported visiting the website at least on a monthly basis. By the time of the final survey, the percentage of control group customers reporting using the website on at least a monthly basis decreased to 67% while the treatment group increased to 69%, but this does not represent a statistically significant change. The reported frequency of customer access to the website remained unchanged throughout the demonstration project, regardless of assignment to treatment or control groups.

Figure 6-2: Avista Website Use by Treatment and Control, Pre and Post-treatment



The initial and final surveys also asked respondents to rate the usefulness of a variety of features found on the website, all of which were available to both treatment and control customers during the course of the study. These questions, summarized in Table 6-1, begin with whether or not respondents used the features. Reported incidence of usage significantly increased across both treatment and control participants between the initial and final surveys for all features except the bill pay feature; the bill pay feature is used by 80% of respondents, on average, and remained steady

throughout the course of the study. Some of these features, at the time of the initial survey, were reported to be used by as few as 10 or 20% of respondents, but by the time of the final survey, were reported to be in use by 40 or 50% of respondents.

While the usage of many website features went up during the course of the study, a difference-in-differences analysis was employed to determine if there was a difference in the increased usage based on assignment to the treatment or control group. First, the difference in reported usage of each feature is determined between the two groups before the treatment occurred (in this case, the initial survey). This difference is then subtracted from the difference in usage of that feature as reported by the treatment and control groups after the treatment (final survey). These values are also reported in Table 6-1. Negative values, such as in the "Pay a bill" case, denote that the treatment actually increased their usage of that feature less than the control group did, though in this example, not significantly so. One feature, the means to inquire about energy saving products, saw a statistically significant decrease in usage among treatment customers between the initial and final surveys. This lone decrease in the usage of a feature could in fact be due to the influence of the treatment, but it is more likely that it is simply due to chance, especially given the isolated nature of this impact.

Generally, the treatment customers did not significantly change their usage of any website features, *relative to the control group*. It does still hold, however, that across both treatment and control customers, usage of all features (except bill pay) increased during the course of the study. FSC concludes that Avista's marketing activity increased the use of the website by customers but the treatment (i.e., availability of interval data) did not increase the effect of the marketing.

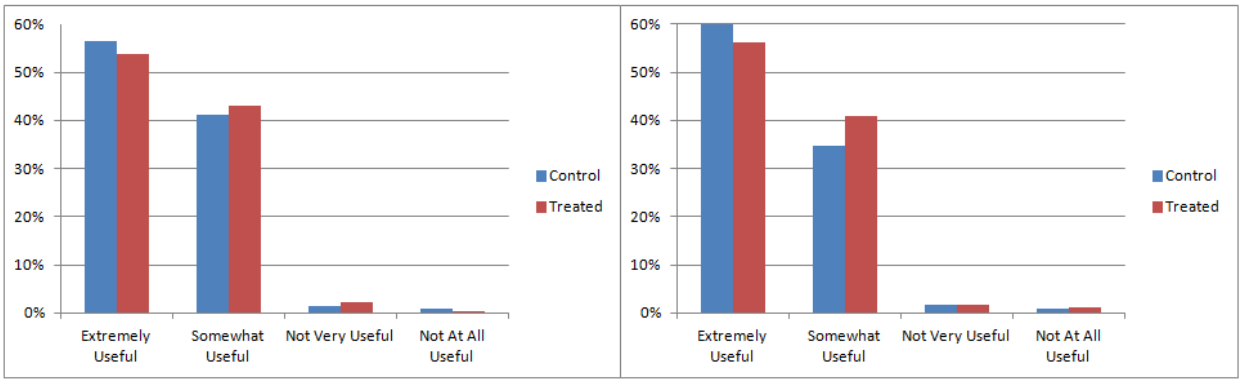
Respondents then rated the usefulness of the features they used. Table 6-1 also includes these results, with 1 representing "Not At All Useful" and 4 representing "Extremely Useful." Among the respondents who reported using the various website features, the ability to view historic gas usage and to inquire about energy saving products were significantly rated as more useful at the end of the study. However, there were no increases in "Extremely Useful" and "Somewhat Useful" ratings that were due to a customer's treatment status – that is, the treatment of receiving access to interval energy usage data did not impact respondents' ratings of usefulness of the various features available on the website. As in the analysis of the usage of website features described above, FSC used the difference-in-differences technique to make the determination of the treatment's effect on the usefulness ratings. Here, a negative difference-in-differences value means that the treatment group did not increase their ratings of the usefulness of the feature as much as the control group did. Again, it appears that the marketing that occurred during the study, to which both sets of customers were exposed, increased consumers' perception of features' usefulness but the treatment did not have any effect.

Table 6-1: Use and Rated Usefulness of Website Features
1="Not At All Useful" 4="Extremely Useful"

Features	Timing	Treatment	N	Percent Reporting Use			Usefulness Rating		
				Percent	Diff-in-diff	P-value	Rating	Diff-in-diff	P-value
Pay a bill	Pre	Control	301	78%	-2.0%	0.66	3.77	-0.03	0.75
		Treatment	316	77%			3.83		
	Post	Control	314	85%			3.79		
		Treatment	331	82%			3.82		
Inquire about a bill	Pre	Control	301	53%	5.8%	0.24	3.59	-0.07	0.99
		Treatment	316	53%			3.66		
	Post	Control	314	83%			3.64		
		Treatment	331	89%			3.64		
View historical energy use	Pre	Control	301	55%	-1.1%	0.83	3.60	0.04	0.81
		Treatment	316	59%			3.55		
	Post	Control	314	84%			3.51		
		Treatment	331	86%			3.50		
View historical gas use	Pre	Control	301	21%	-3.5%	0.50	3.64	-0.02	0.61
		Treatment	316	21%			3.53		
	Post	Control	314	58%			3.50		
		Treatment	331	54%			3.37		
Analyze bill to find energy saving opportunities	Pre	Control	301	18%	-7.5%	0.14	3.33	-0.04	0.86
		Treatment	316	24%			3.22		
	Post	Control	314	57%			3.19		
		Treatment	331	56%			3.05		
Inquire about energy saving products	Pre	Control	301	11%	-10.0%	0.04	3.32	-0.01	0.63
		Treatment	316	14%			3.20		
	Post	Control	314	48%			3.03		
		Treatment	331	41%			2.90		
Home energy audit	Pre	Control	301	9%	-6.4%	0.16	3.11	-0.23	0.23
		Treatment	316	10%			3.19		
	Post	Control	314	43%			3.08		
		Treatment	331	38%			2.93		
Inquire about payment options	Pre	Control	301	24%	-7.5%	0.15	3.48	-0.13	0.95
		Treatment	316	25%			3.47		
	Post	Control	314	61%			3.43		
		Treatment	331	54%			3.30		

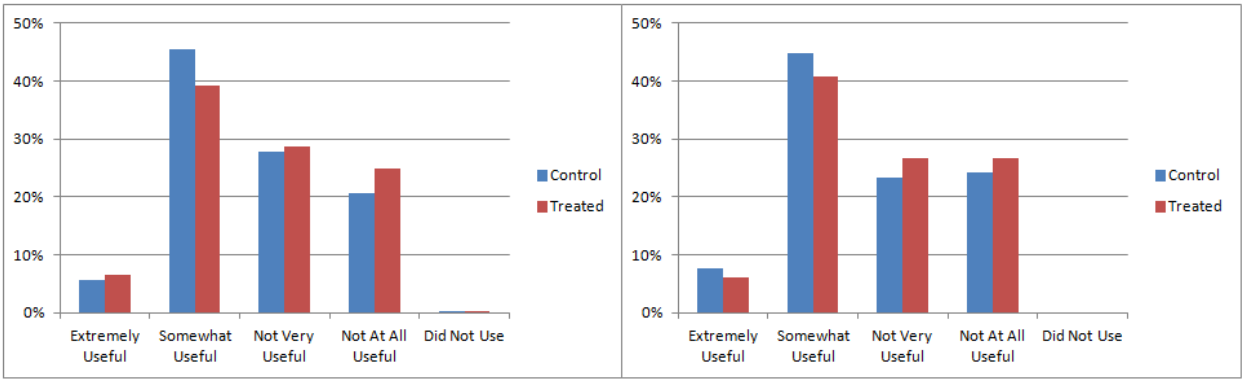
Respondents were also asked to rate the usefulness of the Avista website overall. Figure 6-3 presents responses to this question. There was no significant change in the proportion of customers who rated the website "Extremely Useful" or "Somewhat Useful" before the demonstration project began compared with the same ratings after the project ended. However, the proportion of customers who gave either of these ratings is extremely high – on average 98%.

Figure 6-3: "Overall, how useful would you say the information provided on the website is?" Responses by Treatment and Control, Pre and Post-treatment



The initial and final surveys also asked customers to rate the ability of the website to help them control their energy costs. The top-two box statistic, which was either an "Extremely Useful" or "Somewhat Useful" rating, was unchanged for treatment and control groups. The responses to this question are presented in Figure 6-4.

Figure 6-4: "To what degree do the features of the website help you control energy costs?" Responses by Treatment and Control, Pre and Post-treatment



The two surveys continue their common content with a series of questions about whether the respondent is aware that they can take certain energy saving actions in their home. The responses to this question are shown in Table 6-2. Awareness of nearly all of these actions increased between the responses of the initial and final surveys, in some cases by large amounts. For example, average awareness of installing dimmers, timers or motion detectors on lights increased from 50% in the initial survey to 68% in the final survey; awareness of installing ceiling fans to circulate warm air increased from 45% to 62% on average. The only actions that did not see a statistically significant increase in awareness were installing weather seals on doors and windows and replacing incandescent lights with

compact fluorescents. The actions with the lowest awareness were performing annual maintenance checks of heating system, replacing furnace filters monthly and sealing ducts. Despite the general increase in awareness across all of the actions, there was no significant increase, however, in awareness of these actions due to the treatment. The test for statistical significance of the effect of the treatment is the same difference-in-differences method used in Table 6-1, and the conclusion drawn by the survey responses presented in Table 6-2 is the same as the responses to earlier survey questions presented in Table 6-1: Avista's marketing increased general knowledge of energy saving tactics, but this occurs equally for both treatment and control. The treatment condition did not incrementally change knowledge of energy saving actions.

Finally, the customers were asked whether they had actually taken the energy saving action, in the case of reporting that they had heard of the action. Responses to these questions are also summarized in Table 6-1. The most common action taken by respondents, by far, is replacing incandescent light bulbs with compact fluorescent bulbs. As would be expected, all of the actions are taken by fewer people than have heard of them. Reports of taking the following six energy savings actions increased between the initial and final surveys (significance at 5% level indicated by **, 10% by *); there was no statistically significant incremental effect due to the treatment:

- Install weather seals on doors and windows (40% to 49%)**;
- Insulate water pipes (29% to 33%)*;
- Install low-flow water heads (43% to 51%)**;
- Reduce water heater temperature (40% to 50%)**;
- Replace incandescent lights with compact fluorescents (73% to 86%)**; and
- Install insulation in walls or ceilings (24% to 28%)*.

Again, the only measurable effect on uptake of energy savings activities or investments appears to be due to Avista's general marketing efforts, which was the same across the treatment and control groups.

Table 6-2: Knowledge of Energy Saving Actions and Reported Energy Saving Actions Taken

Actions	Timing	Treatment	N	Heard of Action?			Taken Action?		
				%	Diff-in-diff	P-value	%	Diff-in- diff	P-value
Replace furnace filters monthly	Pre	Control	301	40%	-0.80%	0.89	68%	10%	0.2
		Treatment	316	41%			70%		
	Post	Control	314	51%			60%		
		Treatment	331	50%			72%		
Install weather seals on doors and windows	Pre	Control	301	72%	2.50%	0.6	61%	4%	0.48
		Treatment	316	74%			59%		
	Post	Control	314	76%			49%		
		Treatment	331	81%			52%		
Insulate water pipes	Pre	Control	301	54%	4.20%	0.44	74%	10%	0.15
		Treatment	316	54%			68%		
	Post	Control	314	66%			66%		
		Treatment	331	70%			69%		
Install low-flow shower heads	Pre	Control	301	62%	3.70%	0.48	58%	8%	0.26
		Treatment	316	60%			55%		
	Post	Control	314	73%			47%		
		Treatment	331	75%			51%		
Reduce water heater temperature	Pre	Control	301	60%	7.70%	0.15	61%	2%	0.76
		Treatment	316	60%			59%		
	Post	Control	314	68%			50%		
		Treatment	331	76%			50%		
Replace incandescent lights with compact fluorescents	Pre	Control	301	79%	2.90%	0.5	26%	-1%	0.9
		Treatment	316	83%			27%		
	Post	Control	314	81%			14%		
		Treatment	331	88%			14%		
Install dimmers, timers or motion detectors on lights	Pre	Control	301	49%	-1.40%	0.8	78%	-3%	0.63
		Treatment	316	51%			76%		
	Post	Control	314	68%			75%		
		Treatment	331	69%			70%		
Install ceiling fans to circulate warm air	Pre	Control	301	45%	2.30%	0.68	63%	1%	0.87
		Treatment	316	44%			64%		
	Post	Control	314	61%			63%		
		Treatment	331	63%			65%		
Perform annual maintenance check of	Pre	Control	301	46%	3.60%	0.52	65%	10%	0.22
		Treatment	316	42%			63%		
	Post	Control	314	56%			57%		

Actions	Timing	Treatment	N	Heard of Action?			Taken Action?		
				%	Diff-in-diff	P-value	%	Diff-in- diff	P-value
heating system		Treatment	331	56%			64%		
Replace windows with more efficient ones	Pre	Control	301	67%	5.40%	0.29	75%	1%	0.89
		Treatment	316	67%			76%		
	Post	Control	314	74%			70%		
		Treatment	331	78%			71%		
Install insulation in walls or ceilings	Pre	Control	301	63%	7.20%	0.17	78%	6%	0.33
		Treatment	316	61%			75%		
	Post	Control	314	69%			71%		
		Treatment	331	75%			73%		
Seal ducts	Pre	Control	301	45%	-0.20%	0.97	82%	3%	0.66
		Treatment	316	45%			82%		
	Post	Control	314	56%			75%		
		Treatment	331	56%			78%		

7 Customer Focus Group Findings

The statistical analyses presented in this report found mixed results with respect to energy savings due to the enhanced online information presentment tested in Avista's Smart Grid demonstration. More than half of the regression specifications tested for estimating natural gas consumption savings produced statistically significant results in the neighborhood of 2% while all regressions tested to estimate electricity savings produced non-significant results. Additionally, pretest and post-test surveys revealed the enhanced content did not significantly impact how much and how often customers accessed the Avista website. These surveys also did not show any evidence that the new information presented on the website affected household energy consumption behavior. However, the fact that the content and functionalities tested here hasn't attracted the attention of many of the customers it was offered to, or that it wasn't compelling enough for customers to return, doesn't mean that energy savings and improved customer satisfaction are not possible with enhanced information offerings on the web. Several other website designs are currently in market in North America, including some that offer more functionality than was tested in this demonstration. Opower, Tendril, Nest and Comcast are among the providers that are marketing an array of online tools that enable consumers to exercise greater control over their home energy use and to be more fully and timely informed of the costs of their energy consumption and how to better manage those costs. Some of these products do not even require advanced metering, some offer customers the ability to control individual appliances and some services are bundled with other internet-enabled functionalities such as home security. Thus, there are a number of potential avenues for Avista to explore with respect to improving or further developing the customer-specific content presented in My Account.

Two focus groups were conducted the evening of April 22, 2013 in Pullman, Washington at the Holiday Inn Express hotel. The discussions were moderated by Dr. Michael Sullivan and were observed by two Avista representatives. Participants were recruited by telephone from a pool of those customers who had affirmed in the second survey that they would be willing to participate in a focus group on the subject of online energy analysis tools. Nine customers participated in each session, and all were compensated $150 in cash at the conclusion of the discussion sessions. *Engaged* customers, who reported visiting the Avista website twice or more during the study, attended the first session. *Disengaged* customers attended the second session, who visited the Avista website less than twice during the study period. Various pages from the live Avista website were shown in each session to facilitate discussion of participants' perceptions of the content.

7.1 Focus Group Study Objective

The objective of the focus groups was to collect in-depth information about what is attracting the engaged customers to the website and what might be turning away one-time only users and what might be done to improve the design of the system to make it more attractive. The discussions also aimed to determine how customers are using the information presented by the Avista website. For the purposes of future program planning it may be useful to present customers who were and were not engaged with the new Avista web content with other websites and HAN-design alternatives to understand what customers like and dislike about these systems.

The two focus group sessions were guided by the same agenda, beginning with a discussion of which websites participants' had used within the last week and an identification of the three that were liked best and why. The discussion continued with prompting the participants to discuss how they used the Avista website, beginning with whether they looked at the Energy Analyzer feature of My Account,

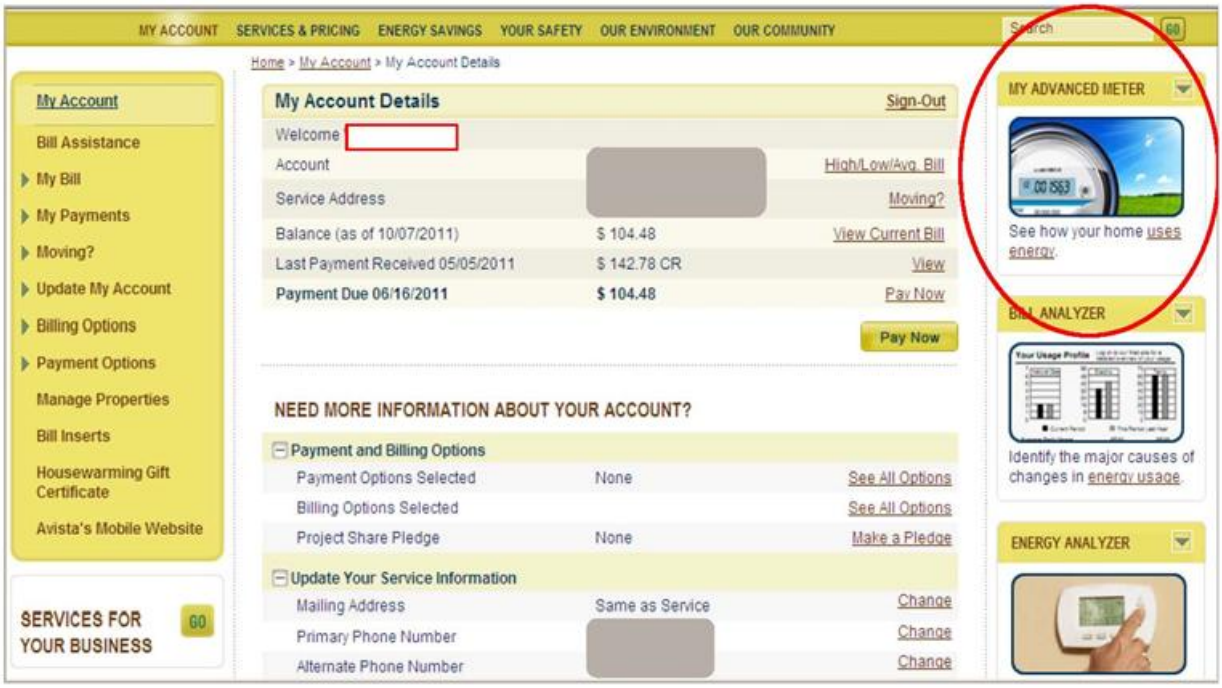
how they found the feature and how they interacted with the Energy Analyzer. Participants were next asked about whether they looked at the My Advanced Meter feature of My Account and about their experience with using that functionality. The sessions concluded with discussing how to make the Energy Analyzer and My Advanced Meter features and the information presented in those features more attractive to customers.

7.2 How Engaged Customers Used the Website

The engaged segment of the demonstration project's participants represent a minority, comprising only 15-20% of Avista's Pullman residential customer base. These customers are younger than the disengaged participants and are more likely to be WSU students. The first focus group discussion among nine engaged customers revealed that these customers primarily use the Avista website to pay their bill and, in the course of paying their bill, to look at their energy consumption for that billing period. Their interest in the household energy usage generally stems from at least one person in the household who thinks that it is important to be energy efficient and who wants to save money. These customers report more engagement with online social media than disengaged customers do, who mostly visit websites in the course of doing their jobs in the work setting. Engaged customers found the Avista website to be slow loading and many of them stated that they didn't like the voice-over animation that was featured on the website at the time of the demonstration project.

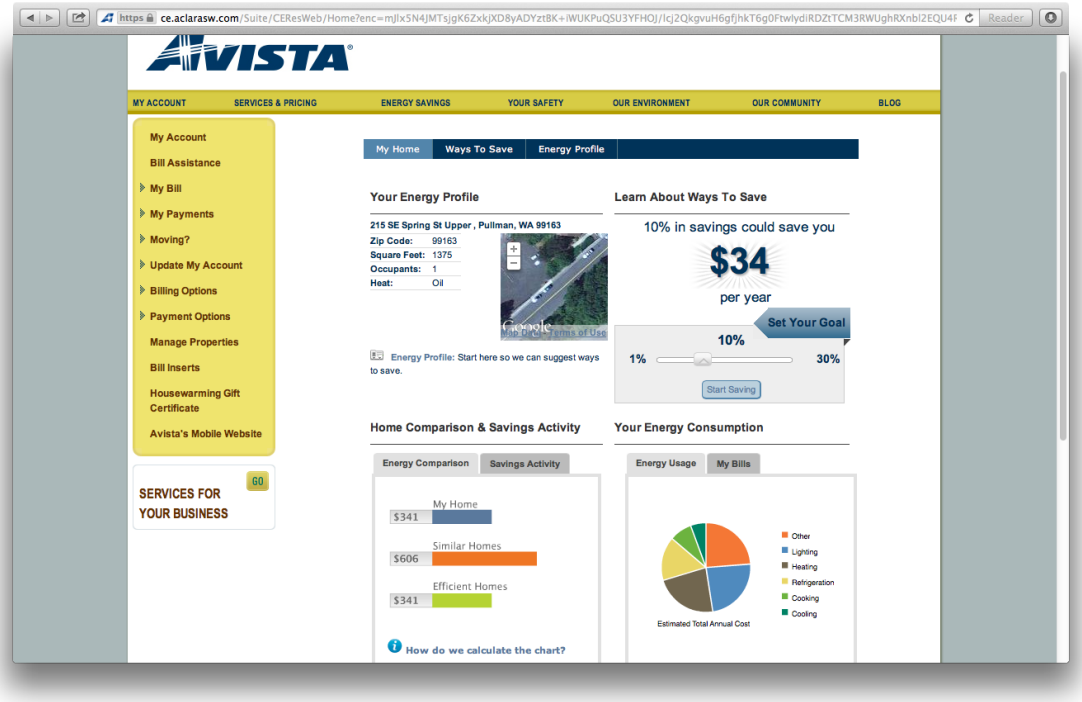
Once logged into My Account, customers can navigate to the My Advanced Meter, Bill Analyzer and Energy Analyzer features. Both My Advanced Meter and Energy Analyzer display information about the household's energy usage. However, none of the engaged focus group participants reported ever clicking on and navigating to the My Advanced Meter feature. Figure 7-1 presents an example screenshot of the My Account landing page, with the My Advanced Meter link circled in red. Discussions about the My Advanced Meter feature revealed that these customers didn't know that the link led to a page that contained information about their energy usage and ignored it. Most of the engaged customers believed that it contained marketing information about their advanced meter because many other websites that they use display marketing information on a crawl on the right-hand side of the browser window. Example screenshots from three popular websites are presented in Appendix C that highlight the use of the right-hand area of the browser window for sponsored or marketing content. However, during the course of the focus group discussion, participants were shown the contents of the My Advanced Meter screen, and all of the engaged participants thought that the information shown there was interesting and useful.

Figure 7-1: Avista My Account Screenshot



Unlike the My Advanced Meter feature, Energy Analyzer was found and used by a majority (seven of nine) of the engaged customers. Six of the nine engaged focus group participants further reported looking at Energy Analyzer content each month. However, those customers who did navigate to the Energy Analyzer generally didn't know how to use the features on the webpage, how the webpage works, or what to do once landing there. Figure 7-2 presents an example screenshot of the Energy Analyzer page, illustrating that the Energy Analyzer function has four options for the user to navigate or choose from: Your Energy Profile; Learn about Ways to Save; Home Comparison; and Your Energy Consumption. While there is an appropriate order for effectively using the Energy Analyzer feature, most customers were not aware of it and, overall, didn't understand the information presented on the Energy Analyzer landing page. Most engaged customers focused their attention on the Your Energy Consumption section and expressed disbelief in the applicability to their household of the information presented there (i.e., estimated appliance shares, household comparisons, tips).

Figure 7-2: Avista Energy Analyzer Screenshot



While the engaged segment of Avista Pullman customer base is in the minority, they do represent a market segment that is in tune with the content Avista is offering and with that of other online media and informational sources. The use of and attention to the Avista website and the enhanced features tested in the demonstration project has yielded some valuable points of insight on the effectiveness of the website's current design and how it can be made better:

- Engaged customers do not understand that information from their advanced meter is observable from the My Account landing page.
- The My Account landing page contains a great deal of visual information and text; however, it is difficult for engaged customers to find the link to their usage information.
- The Energy Analyzer needs a step-by-step explanation of how to use it and what the customer will achieve or learn by using it. Dynamic, greyscale numbers in the background of each step of the process can guide customers to using the Energy Analyzer effectively and keep them oriented to where they are within the Energy Analyzer tool relative to its final goal or informational outcome.
- Development of effective design for information presentment on the Avista website should require experimentation and testing with human subjects, but could be done using experimental design techniques such as test and learn.

7.3 How Disengaged Customers Used the Website

The second focus group session of nine disengaged customers represented an older segment of Avista's residential customers in Pullman. These customers are more likely to be active or retired Washington State University faculty or staff. The evening's discussion revealed that these customers don't have a great interest in their household's energy use and only use Avista's website to pay their bill, if at all. When presented with the historic usage information presented on the website, they stated that they liked the information; however, these customers also indicated that they would not

likely seek to view their historic usage on their own using the website. When asked about whether or not viewing their historic usage could be an influence on their energy consumption behaviors, these disengaged customers mostly said that the information would not be likely to change their electricity usage habits.

The disengaged customers discussed a wide range of website capabilities that might attract them to, or attract them to visit more often, the Avista website. Contests among customers involving energy savings that required daily or monthly tracking would be of interest to these customers. For example, daily or monthly neighborhood savings contests that involve prizes for those who save the most energy would motivate these customers to learn more about and reduce the energy consumption of their household.

Participants also indicated a strong interest in the energy consumption of individual end-uses in their home. They suggested that an online reference feature for looking up and comparing the energy intensities of different appliances, electronics or other products would be useful to them. Along similar lines, a tool that forecasts the bill change (in dollars per month or year) if old appliances are changed out with more energy efficient models, or if new, additional appliances are added to the household. Further, a tool presenting realistic end-use load disaggregation was cited as a likely driver to the website. Participants expressed an interest in having real time visibility of energy consumption down to the individual end-use level.

7.4 Summary and Conclusions

The responses of focus group participants suggest that the current website design has several serious design flaws that undermine its usefulness for informing and educating customers about the energy use in their household. They are:

- The design of the landing page does not effectively convey the location of energy use related information to users. Consequently, virtually no one in the test was exposed to the information that the smart meters can supply. This occurred because the meter tile (where smart meter based usage information can be accessed) was simply ignored by customers upon arriving on the landing page and was interpreted by most users as a marketing crawl similar to those found on Yahoo, Google and other commercial websites. Some said they thought the content under the smart meter tile was information about the meter installation program. No one thought it contained smart meter data.
- Customers did not understand the underlying logic of the Energy Analyzer. They did not comprehend that there is an order to which the tool was to be experienced and reported that they only entered the analyzer once or twice and then ignored it because it was not providing useful information.
- Most customers had no motivation for accessing the information and tools provided on the website and found the information on the website to be of little use. It is not that some do not want the information about their energy use; it is that they do not want the kind of information currently provided. Consequently, most customers do not consult the energy use information on the website more than once. Part of the problem is that they really have no need for most of the provided information. They don't need to track their energy use except as a matter of curiosity or perhaps to satisfy a desire to better understand their environment; and there is a cost in time and effort required to access the website.

Although the results of this test are disappointing, they should not be taken as a basis for concluding that the website channel is not a useful means for conveying information to customers about their energy use. This particular website design certainly doesn't work and should be abandoned.

However, it is possible that a more effective website design will be available in the future. When that occurs it will be simpler, more intuitive and more attractive to customers than the current design.

Appendix A Initial Customer Survey Findings

An initial survey to assess baseline household behaviors impacting energy usage was administered to Avista's residential customer base in Pullman on October 7, 2011. Invitations to the online survey were sent to 2,000 randomly selected customers from both treatment and control groups. A follow-up email was sent to those who had not completed the survey by October 18, and a hardcopy survey was mailed to those who had not yet completed the online survey by October 24. A final reminder email was sent on October 27 to the remaining non-respondents. In total, 1,055 customers responded, yielding a 53% response rate. 780 (74%) of the surveys were completed online, with the remainder completed on paper and returned to FSC by U.S. Mail. 511 (48%) surveys were completed by control group customers and 544 were completed by treatment group customers.

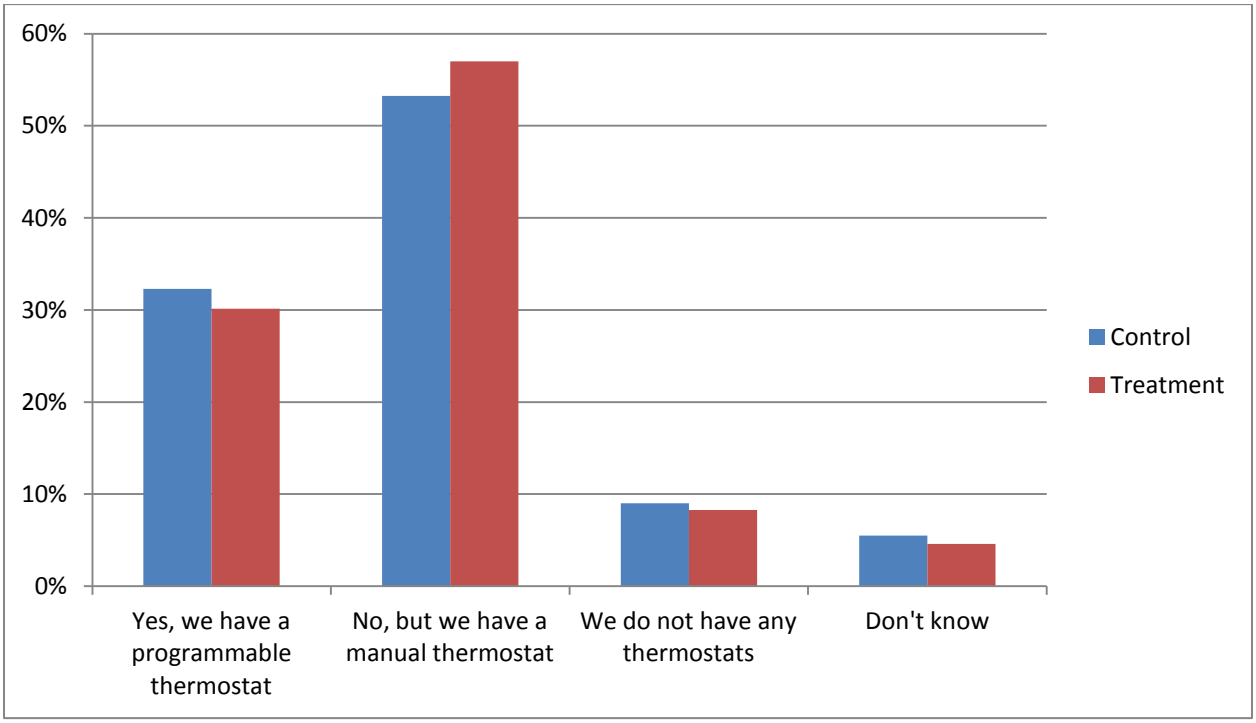
Section A.1 summarizes the responses to questions specific to the initial survey (excluding any questions asked in the second survey as well). Responses to questions asked in both the initial and final surveys are addressed in section 6. Because the initial survey was administered prior to the start of the demonstration project, FSC does not expect to find any significant differences in the responses of the treatment and control customers. Responses are disaggregated by treatment and control in this appendix with annotations indicating significant differences in response where appropriate. These significant differences between responses of treatment and control customers are limited, providing further evidence of valid randomization in selecting the treatment and control groups.

Section A.2 compares the demographics of both the treatment and control groups as well as by survey mode (paper vs. online), as reported in response to the demographic questions of the initial survey. There were no significant differences in the responses to demographic questions between the treatment and control customers, the expected outcome of an effectively randomized assignment to treatment and control groups.

There are a number of significant demographic differences between customers who completed the survey online and those who completed it on paper and returned it by U.S. Mail. Customers who completed the paper survey are more likely to own their home, live in single-family detached housing, have fewer other adults (age 18-64) residing with them and have more senior citizens (age 65 and above) residing with them. Paper survey respondents are also more highly educated. These differences are commonly found between respondents of online and paper surveys and would represent a significant response bias if the survey had only been administered online. Many of these respondents either do not have regular internet access or are not responsive to calls to action or messaging delivered by online modes. Even these less connected customers represent an important residential market segment and learning about how well the Avista website meets their needs, or could meet their needs in the future, is an important aspect of this study that underscores the importance of mixed-mode survey administration.

A.1 Baseline Household Behavior Impacting Energy Usage

Figure A-1: "Some homes have thermostats that can be set to different temperatures for different times of the day and days of the week. These are called programmable thermostats. Does your home have a programmable thermostat?" n = 1,055



Tables A-1 and A-2 show responses to questions about thermostat set points of respondents who report having programmable thermostats. Table A-3 shows responses to a thermostat set point question of customers who report having a manual thermostat.

The difference in reported programmed thermostat set points between treatment and control customers is significant: customers with programmable thermostats in the treatment group report higher daytime and nighttime set points compared to their control group counterparts.

Table A-1: "What is the temperature set to in winter (November – February) during the daytime hours from 10 AM through 5 PM?" n = 316

Statistics	Control	Treatment
N	159	157
Mean (°Fahrenheit)	65.6	66.8
Standard Error	0.38	0.39
P-value	0.019	

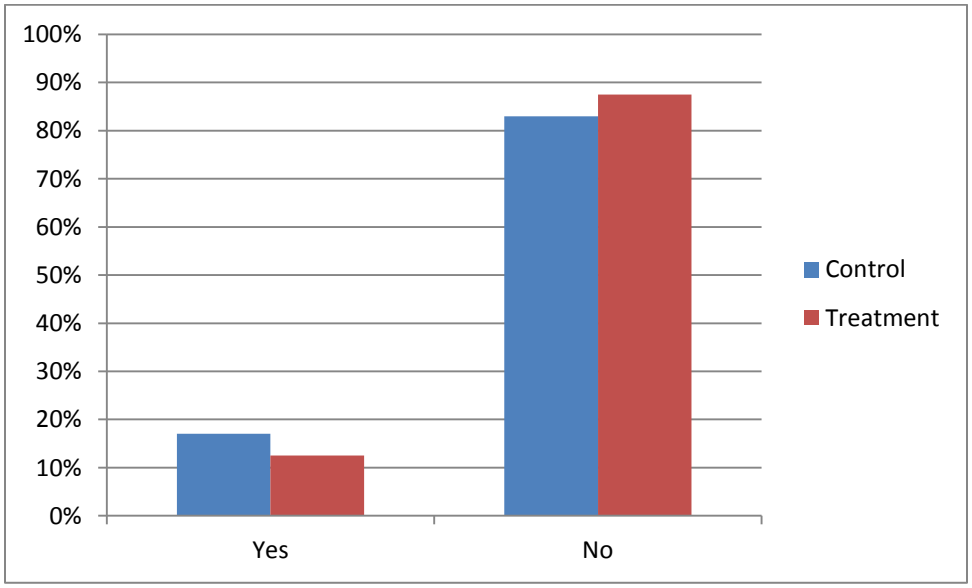
Table A-2: "What is the temperature set to in winter (November – February) during the nighttime hours from midnight to 5 AM?" n = 313

Statistics	Control	Treatment
N	157	156
Mean (°Fahrenheit)	63.6	64.9
Standard Error	0.40	0.38
P-value	0.024	

Table A-3: "What is the temperature set to during the winter time (November – February)?" n = 480

Statistics	Control	Treatment
N	225	255
Mean (°Fahrenheit)	67.0	66.5
Standard Error	0.38	0.36
P-value	0.34	

Figure A-2: "Are there any lights inside or outside your home that you leave on all the time?" n = 1,055



Significantly fewer customers in the treatment group report having lights in the home that are on all the time.

Figure A-3: "Are there any lights inside or outside your home on timers?" n = 1,055

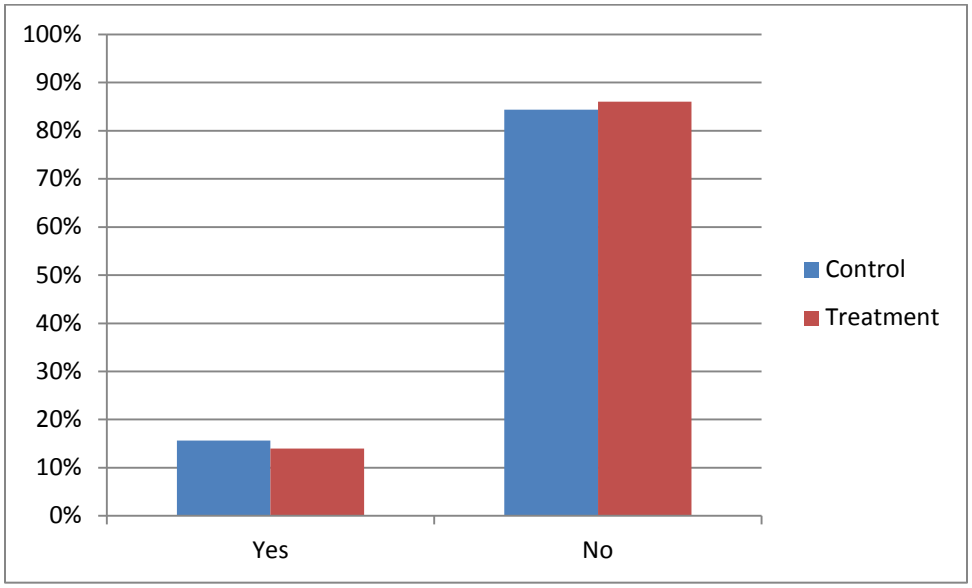


Figure A-4: "Are there any compact fluorescent light bulbs installed in any of the ceiling fixtures in your home? Compact fluorescent light bulbs – also known as CFLs – usually do not look like regular incandescent bulbs. The most common type of CFL is made with a glass tube bent into a spiral, resembling a soft-serve ice cream." n = 1,055

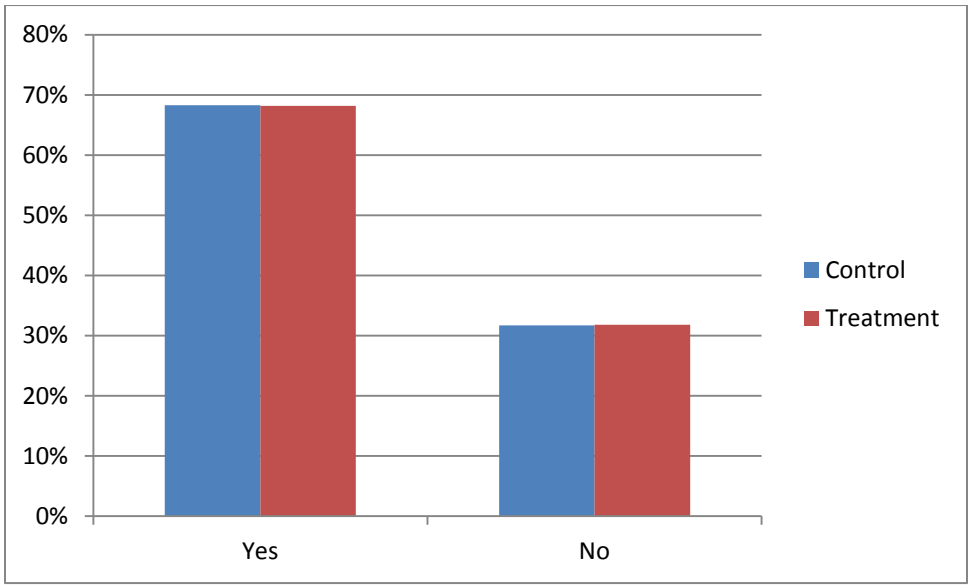


Figure A-5: "Are there any compact fluorescent light bulbs installed in any of the floor or table lamps in your home?" n = 1,054

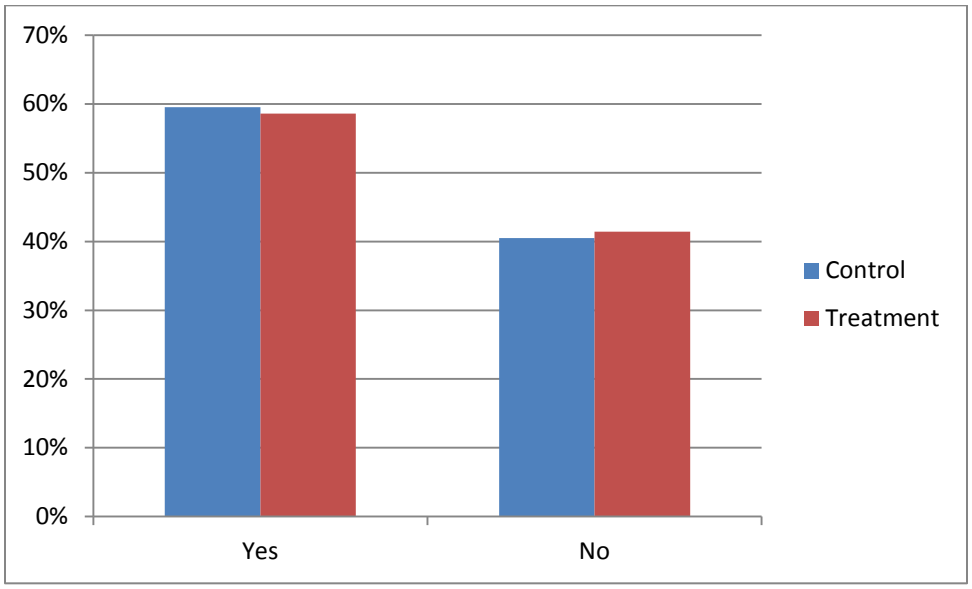


Figure A-6: "Are any of the lights in your home on motion detectors?" n = 1,055

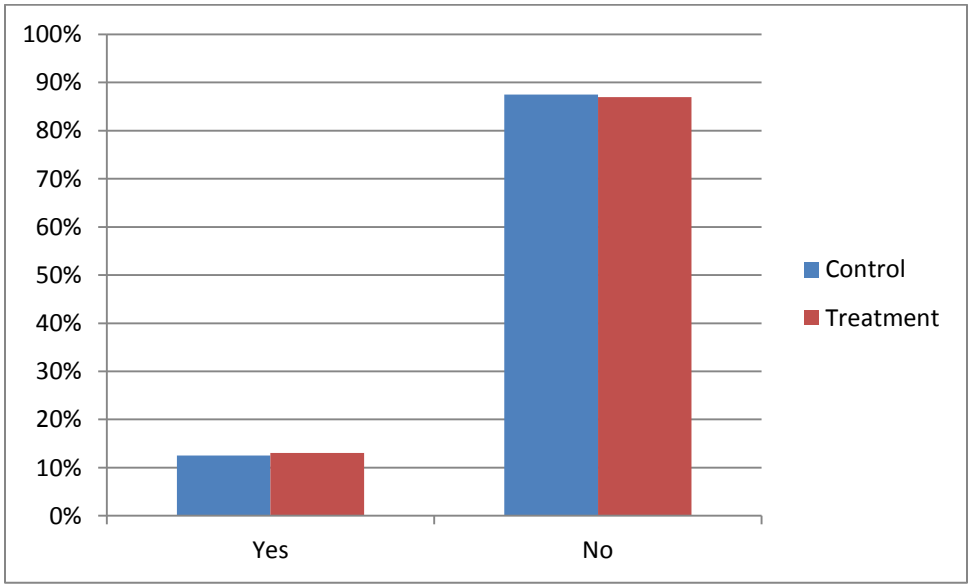


Figure A-7: "If any of the lights in your home are on motion detectors, how many?" n = 134

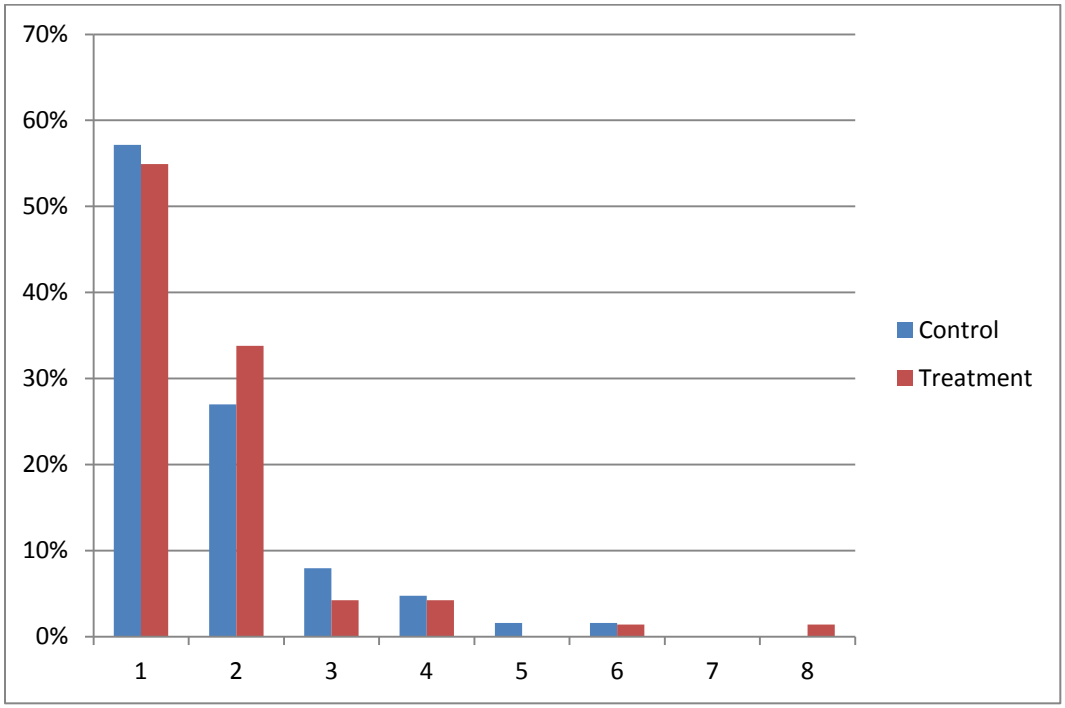


Figure A-8: "Does your home have an electric dishwasher?" n = 1,055

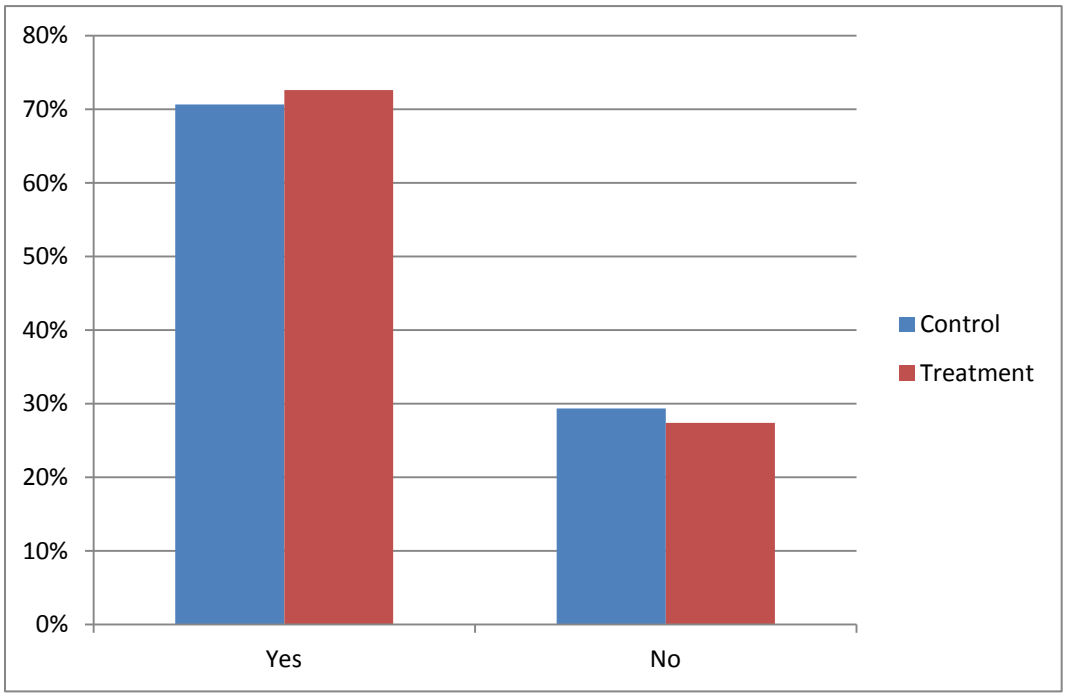


Figure A-9: "If your home has an electric dishwasher, about how many loads of dishes does your household wash per week?" n = 744

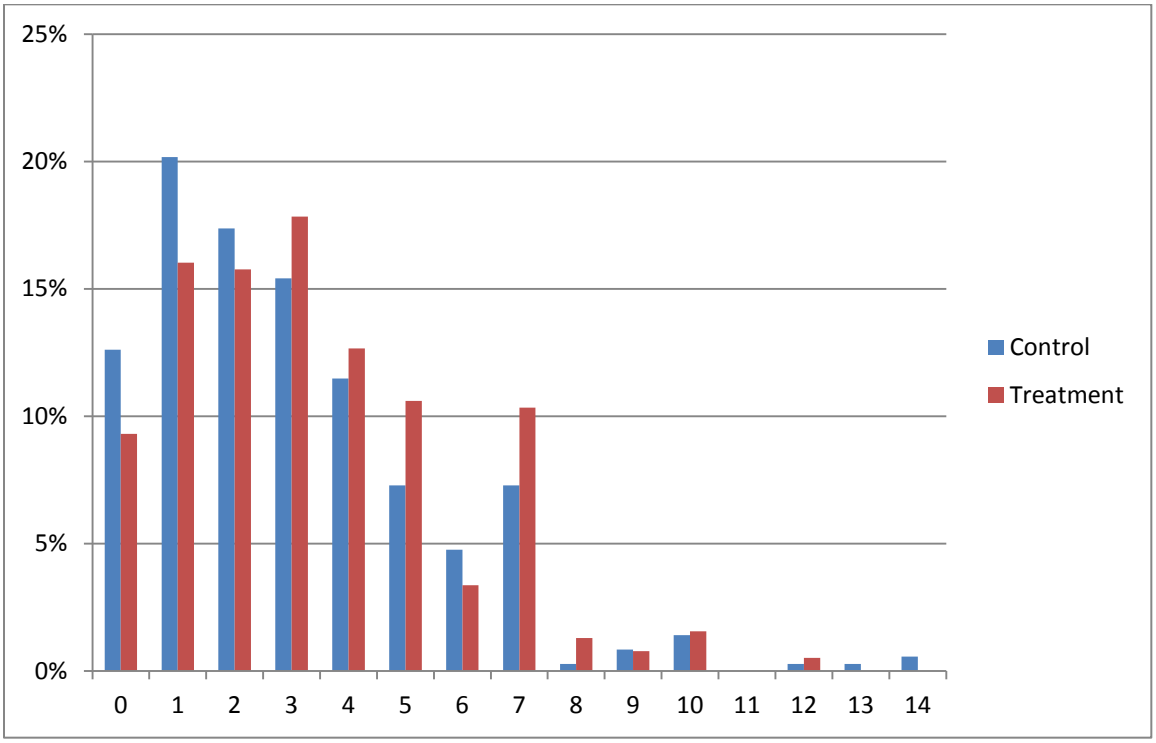


Figure A-10: "Does your home have an electric clothes washer or dryer?" n = 1,055

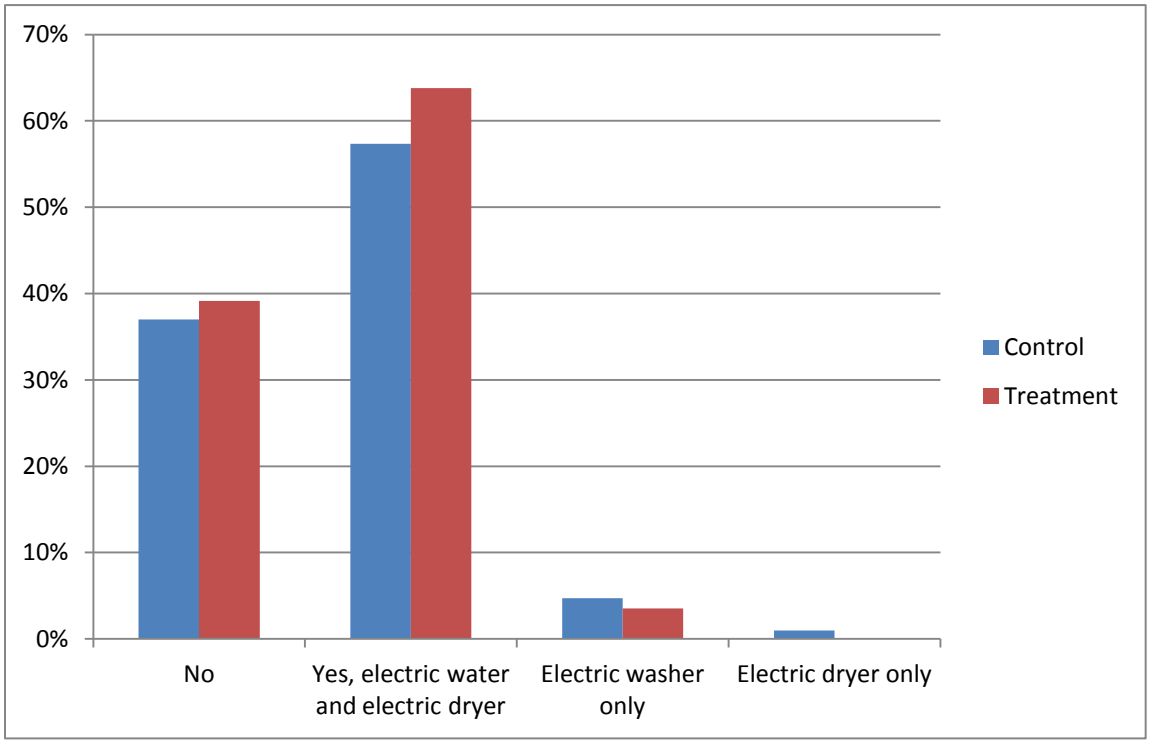
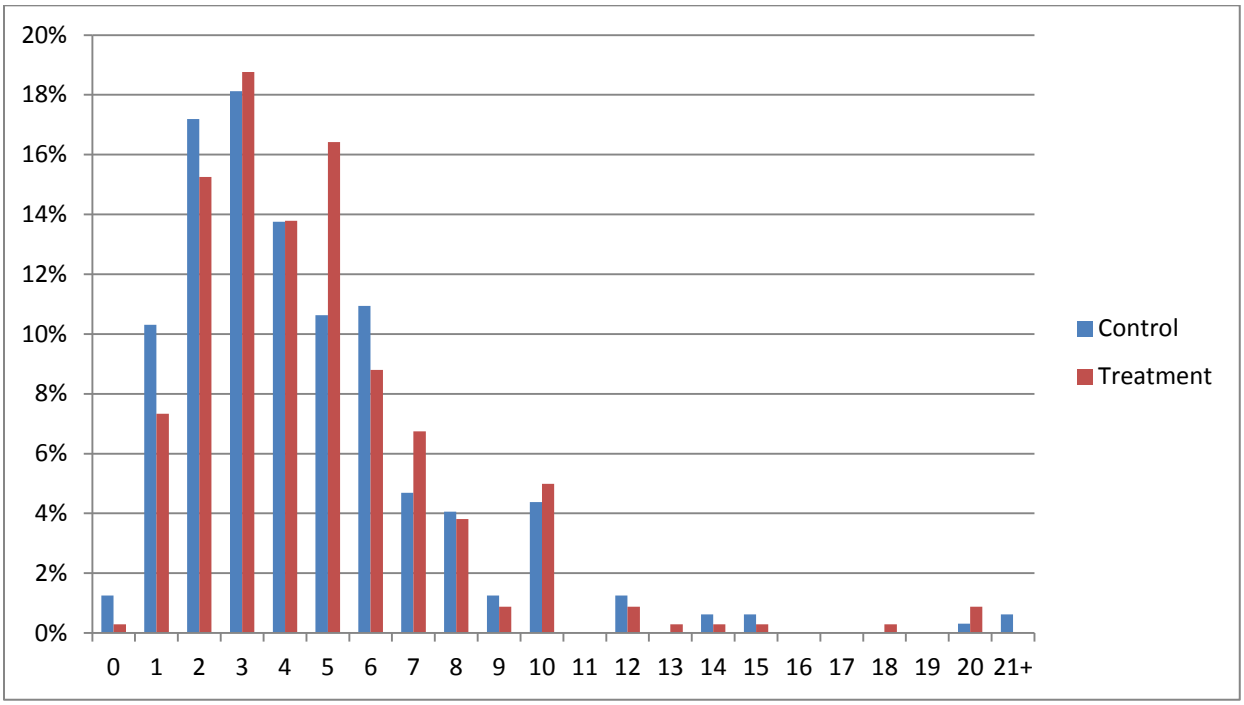
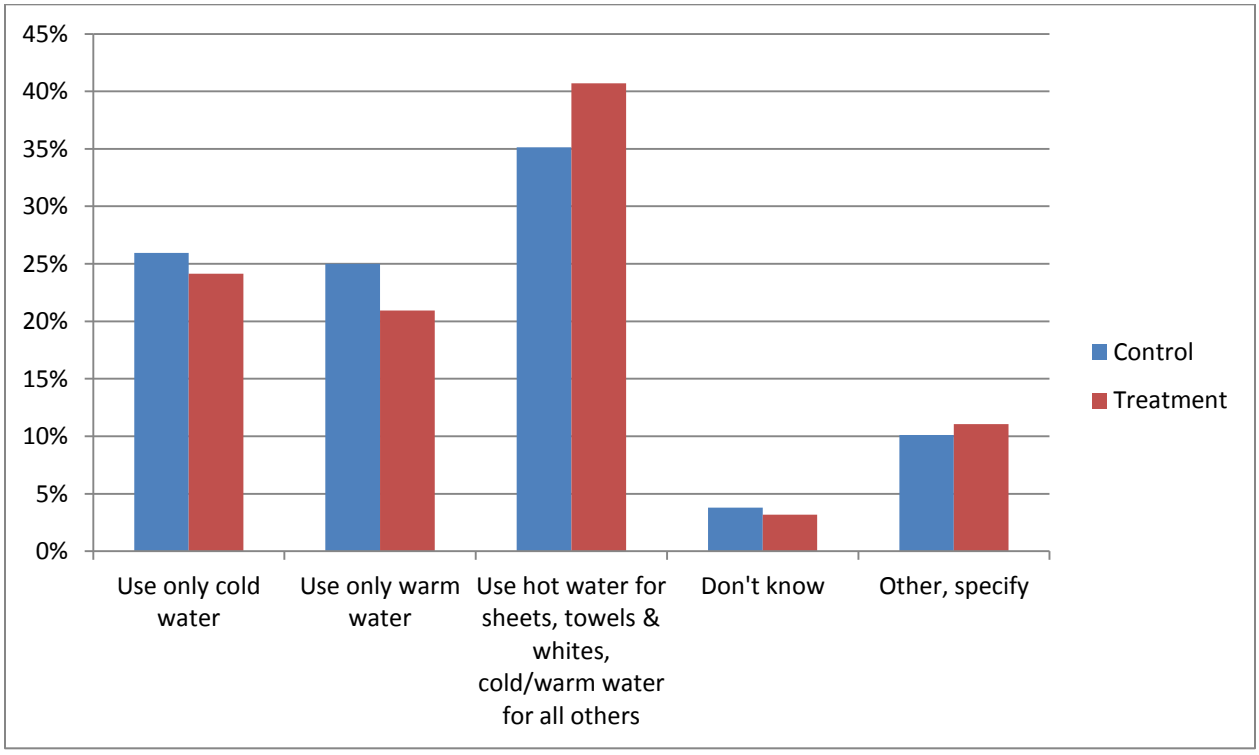


Figure A-11: "If you do have an electric clothes washer or dryer, how many loads of laundry does your household wash per week?" n = 661



Most (83%) of the "Other" specifications were "use both warm and cold water" (83%).

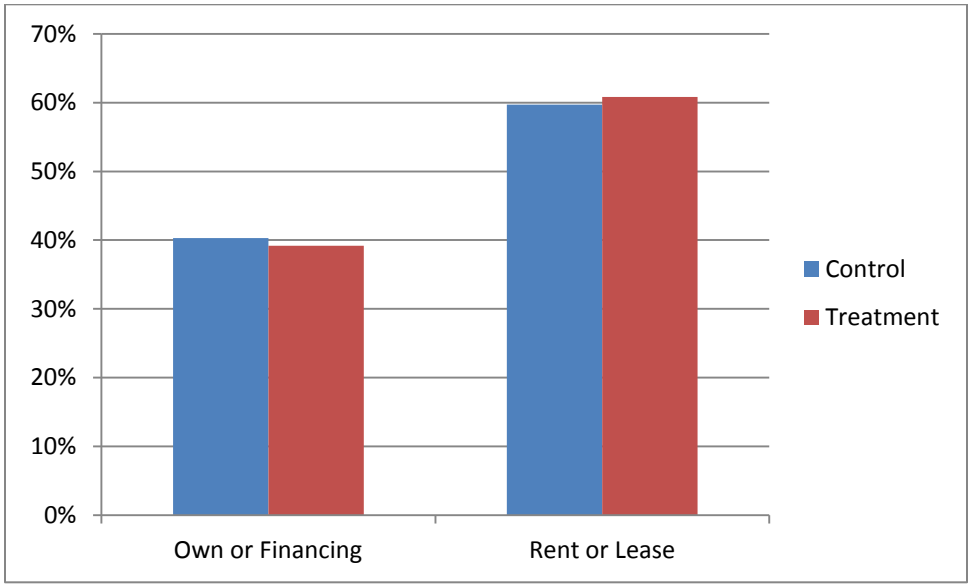
Figure A-12: "If you do have an electric clothes washer or dryer, which of the following best describes the water temperature used when your household does laundry?" n = 660



A.2 Comparisons of Responses to Demographic Questions

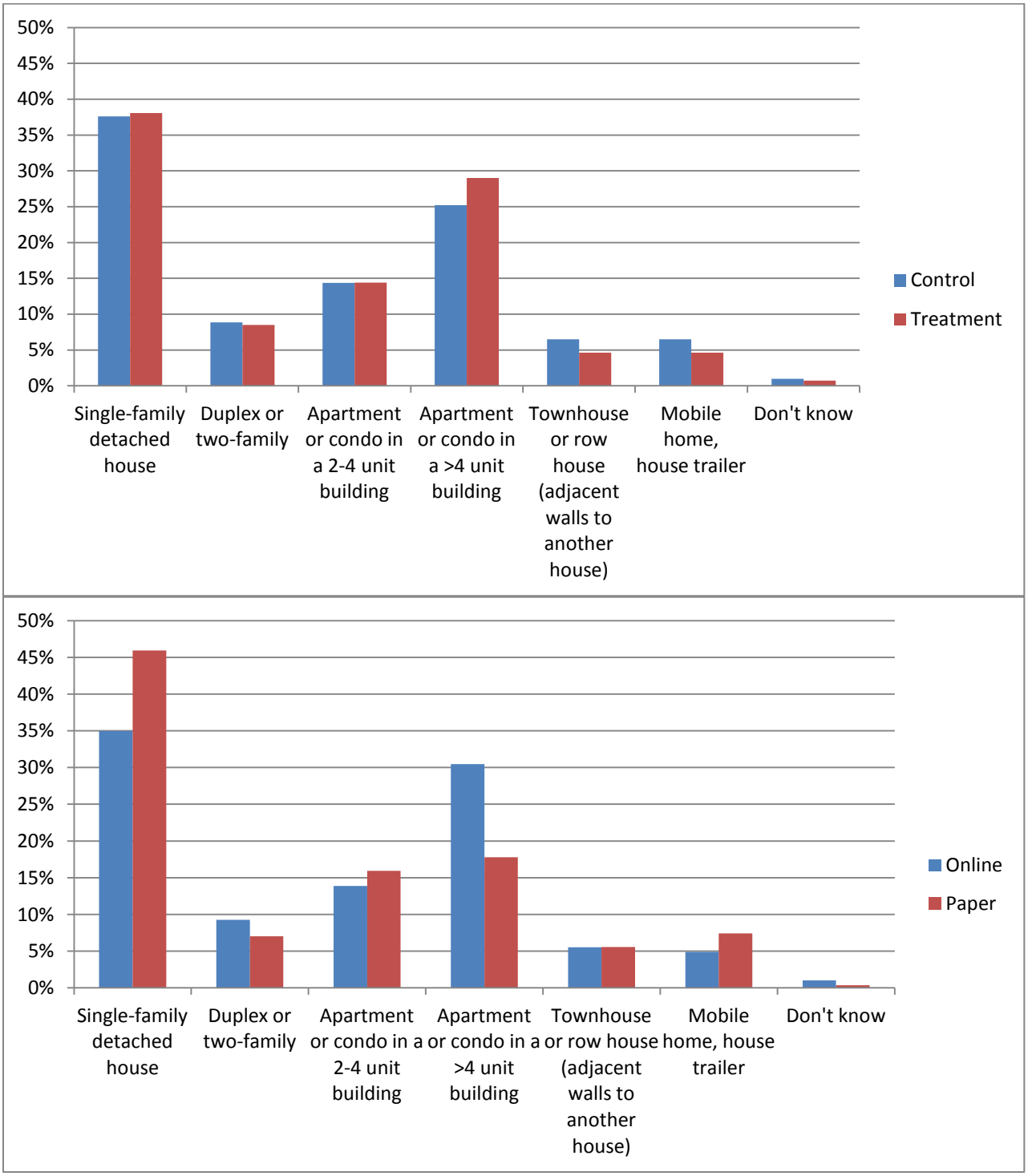
No statistically significant differences in responses to demographic questions were found between treatment and control customers responding to the final survey. A number of differences in responses to demographic questions were found between respondents of the online survey and those who completed the paper survey. These differences are typical and expected and illustrate the importance of mix-mode customer contact protocols for market research. Responses to the demographic questions of the final survey are shown in Figures A-13 through A-19.

Figure A-13: "Do you own or rent you home?" n = 1,052



Customers who completed the paper survey are significantly more likely than those who completed the online survey to own their home.

Figure A-14: "What type of structure is this residence? Is it a…" n = 1,049



Customers who completed the paper survey are more likely than those who completed the online survey to live in a single-family detached home.

Figure A-15: "Please indicate the number of persons in each age category that currently reside in your home: Children under 18." n = 1,051

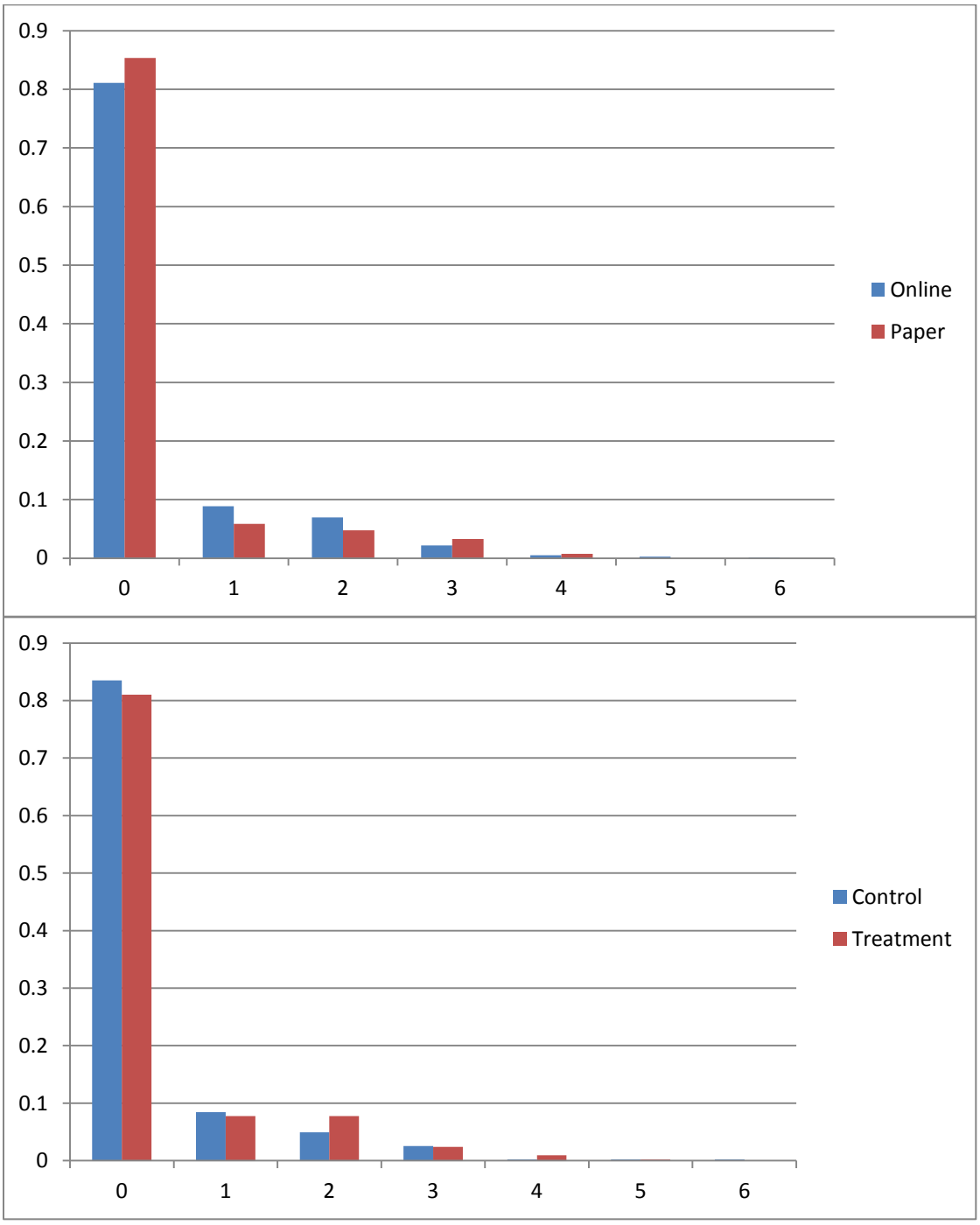
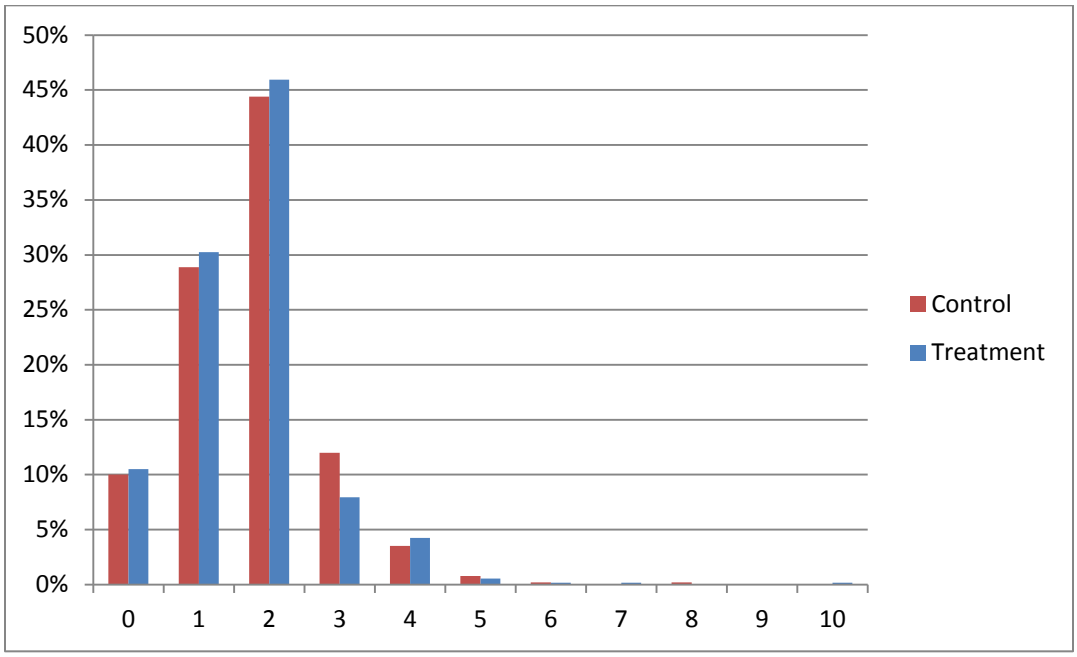
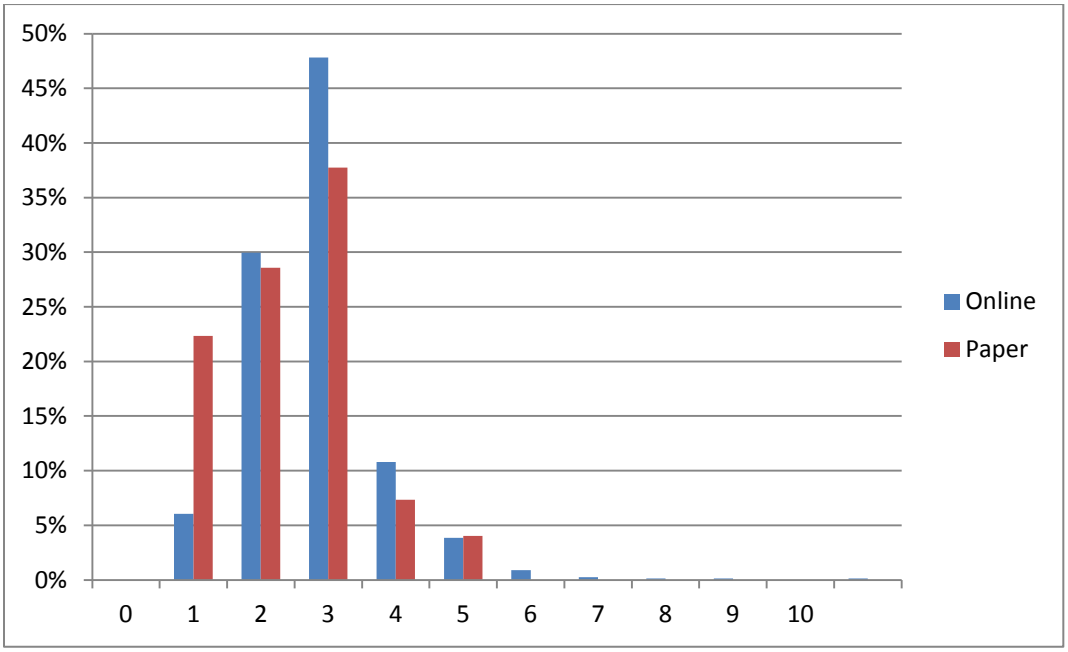


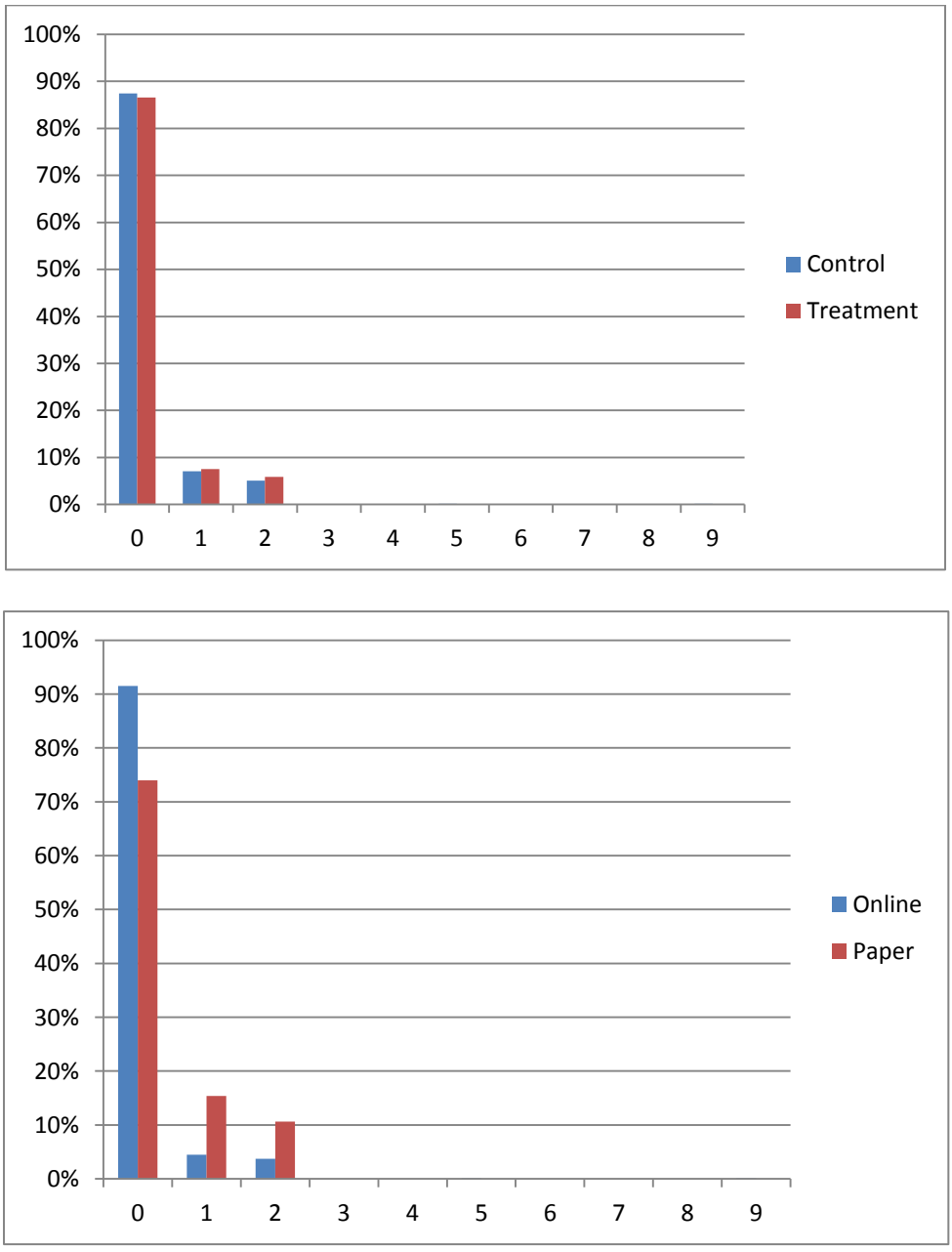
Figure A-16: "Please indicate the number of persons in each age category that currently reside in your home: Adults 18-64." n = 1,051





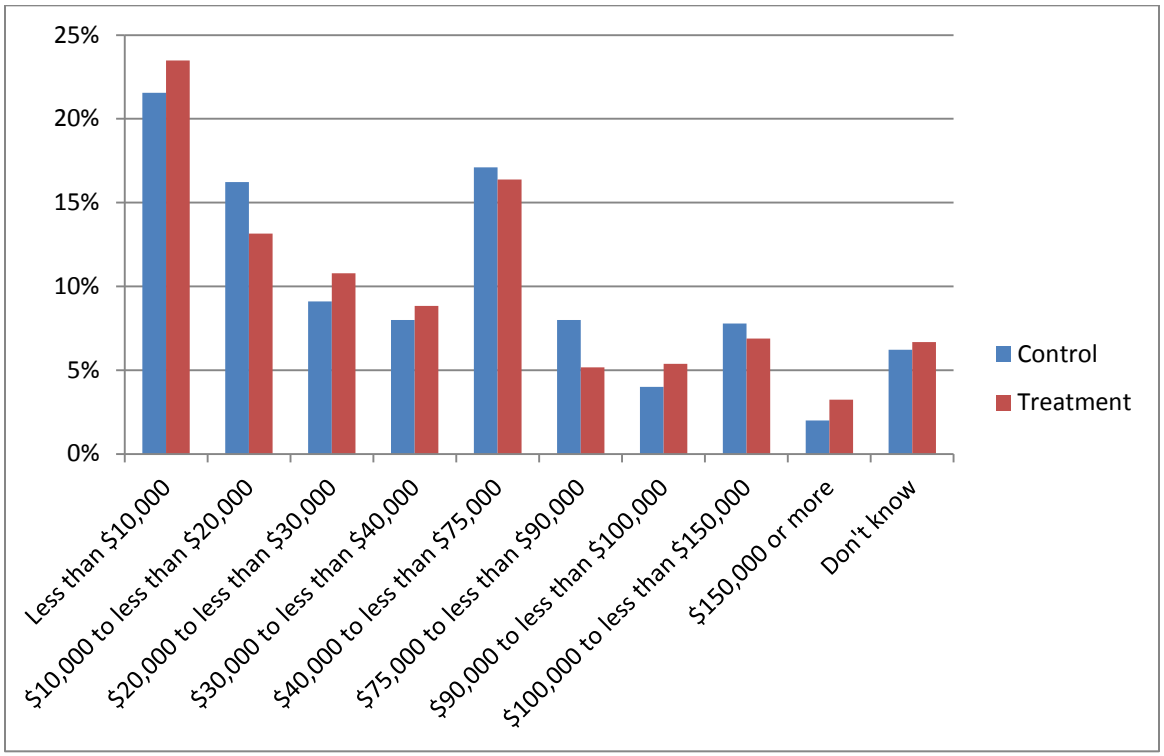
Customers who completed the paper survey are significantly more likely to have fewer adults (age 18-64) residing in their home than the customers who completed the online survey.

Figure A-17: "Please indicate the number of persons in each age category that currently reside in your home: Adults 65 and over." n = 1,051



Customers who completed the paper survey have significantly more adults over the age of 64 residing in their home than the customers who completed the online survey.

Figure A-18: "Which of the following income categories best describes your total household income for 2010 from all sources before taxes?" n = 914



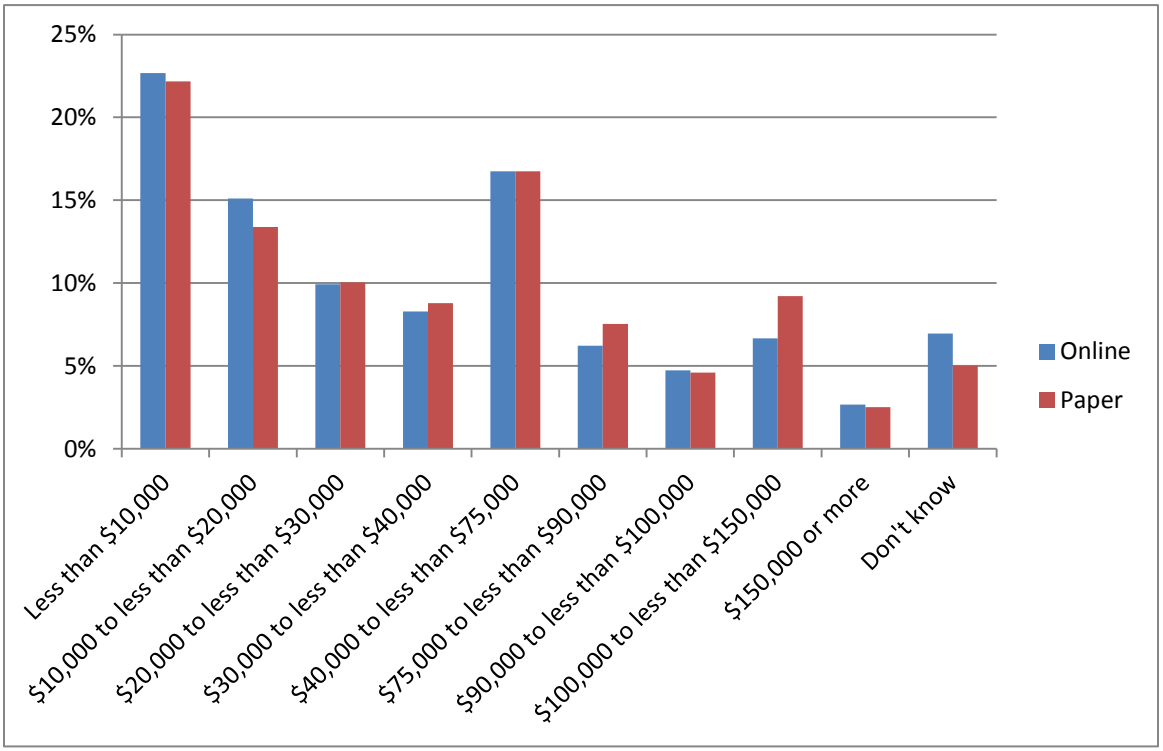
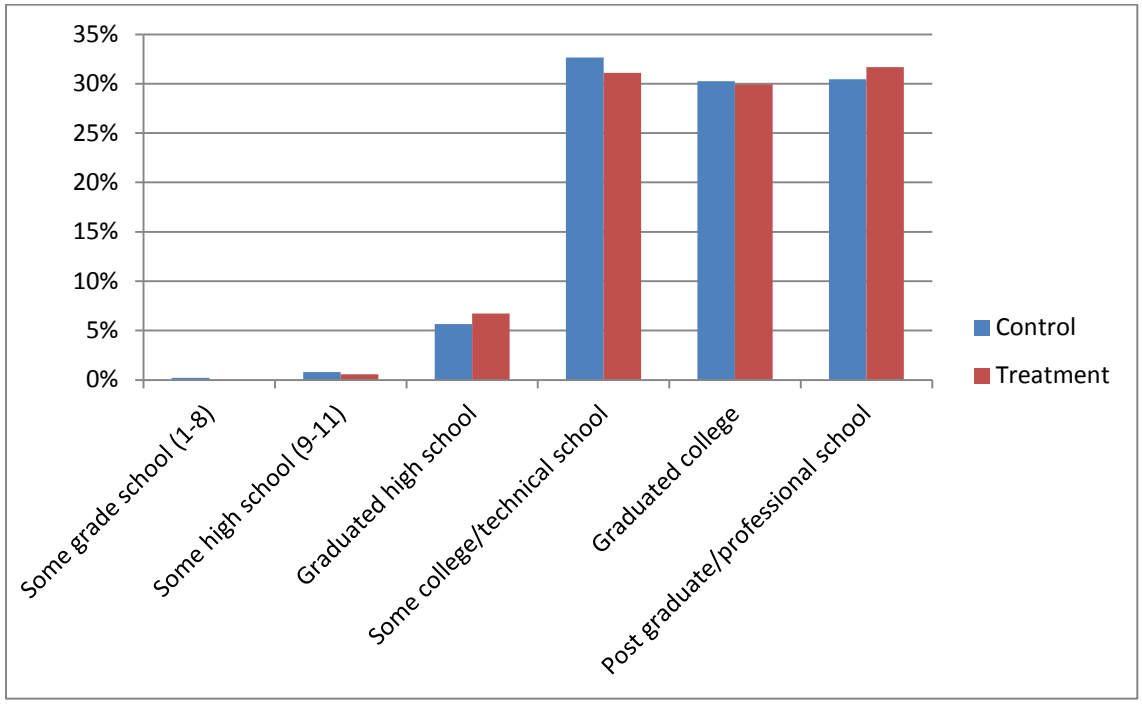
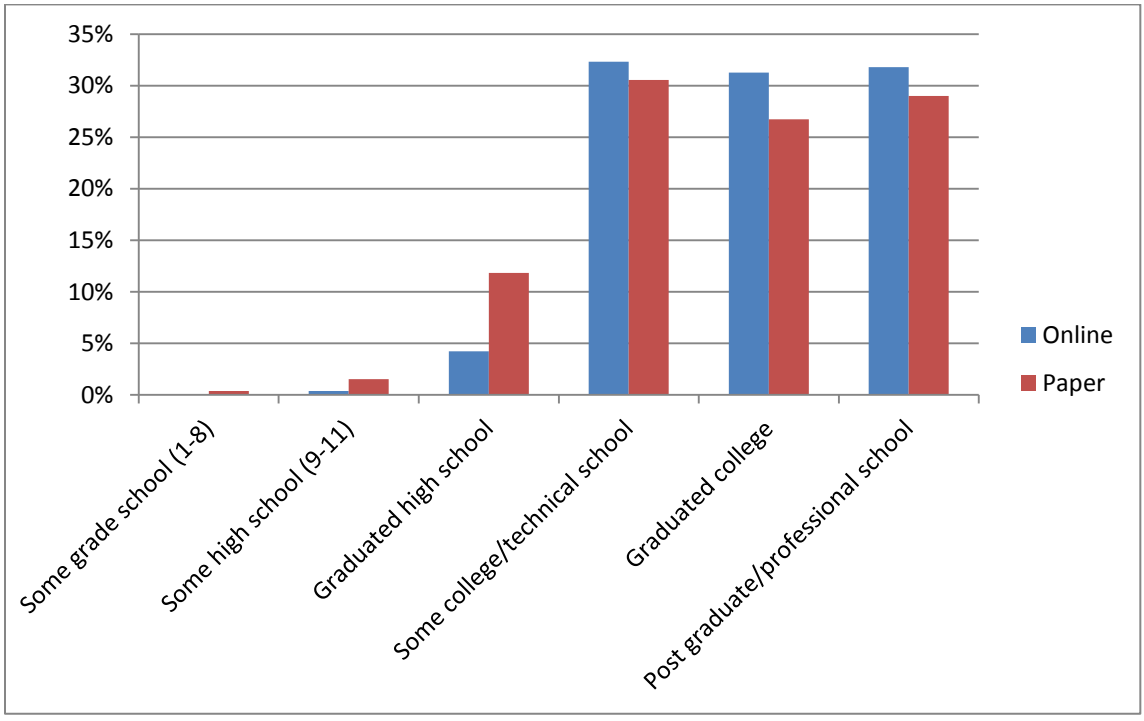


Figure A-19: "What is the highest level of education you have completed so far?" n = 1,017





Customers who completed the paper survey have completed significantly less education than the customers who completed the online survey.

Appendix B Final Customer Survey Findings

A final survey was administered to Avista's Pullman customer base on April 9, 2012, which included some of the same questions that appeared in the initial survey. These questions that were common to both surveys can be compared on a difference-in-differences basis that accounts for changes in responses between treatment and control customers before and after the treatment that are exogenous to the treatment itself. The comparative analysis of these questions is found in Section 6 of this report.

The remainder of the questions in the final survey concern the level of customer engagement with Avista, opinions about saving energy, willingness to make changes to control energy consumption and overall satisfaction with Avista services. Customers who reported using the Energy Analyzer feature were asked a short series of questions designed to assess their engagement with the website, their satisfaction with the content and format of the information provided and their opinion as to whether or not the information on the website was helpful in controlling their energy consumption.

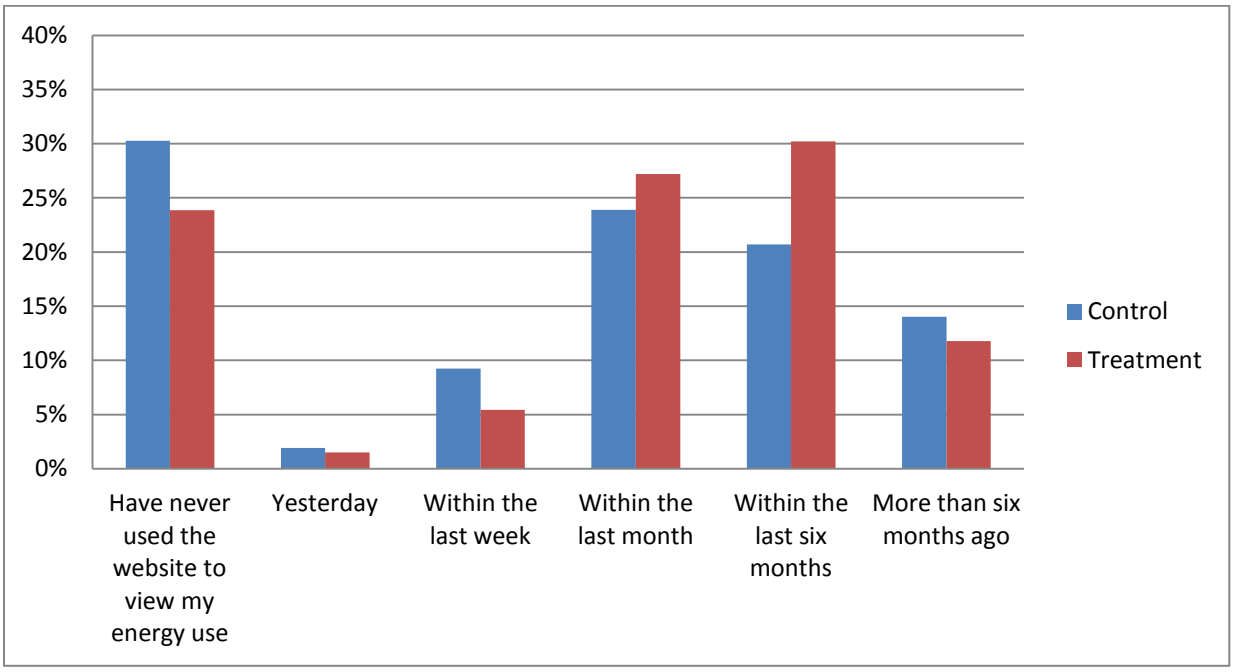
The final survey was administered using the same contact protocol as was used for the initial survey. Invitations to the online survey were sent to 2,000 randomly selected customers from both treatment and control groups. A follow-up email was sent to those who had not completed the survey by April 11, and a hardcopy survey was mailed to those who had not yet completed the online survey by April 17. A reminder email was sent on April 22 to remaining non-respondents which was followed up on April 30 with a final email reminder. In total, 1,006 customers responded, yielding a 50% response rate. 848 (84%) of the surveys were completed online, with the remainder completed on paper and returned to FSC by U.S. Mail. 494 (49%) surveys were completed by control group customers and 512 were completed by treatment group customers.

The responses to the questions that appeared only on the final survey are organized in the following sub-sections of this appendix according to their corresponding primary research question. Sub-section B.1 presents responses concerning the customer experience of the Avista website Energy Analyzer feature to view energy usage information. Sub-section B.2 contains responses pertaining to changes customers reported making in the home based on information provided by the Energy Analyzer. Sub-section B.3 presents responses about how customers perceive and are satisfied with Avista services. This appendix concludes with an analysis of responses to demographic questions by treatment and control status as well as by survey mode. The results of the analysis of responses to demographic questions in the final survey are very similar to those of the initial survey.

B.1 Customer Experience Using the Energy Analyzer

All customers who reported hearing of and using the Avista website were asked how recently they used the Energy Analyzer feature; responses to this question are shown in Figure B-1. 361 respondents reported either never hearing of the Avista website or never using it. Of the remaining 645 Avista website users, 27% (174) reported never viewing their energy use using the Energy Analyzer. 35% (223) of respondents reported using the Energy Analyzer at least as recently as within the last month. 38% (248) reported using the report some time ago, either within the past six-months or more than six-months ago. Overall, about a third of Avista website users can be said to have used the Energy Analyzer relatively recently at the time of the survey.

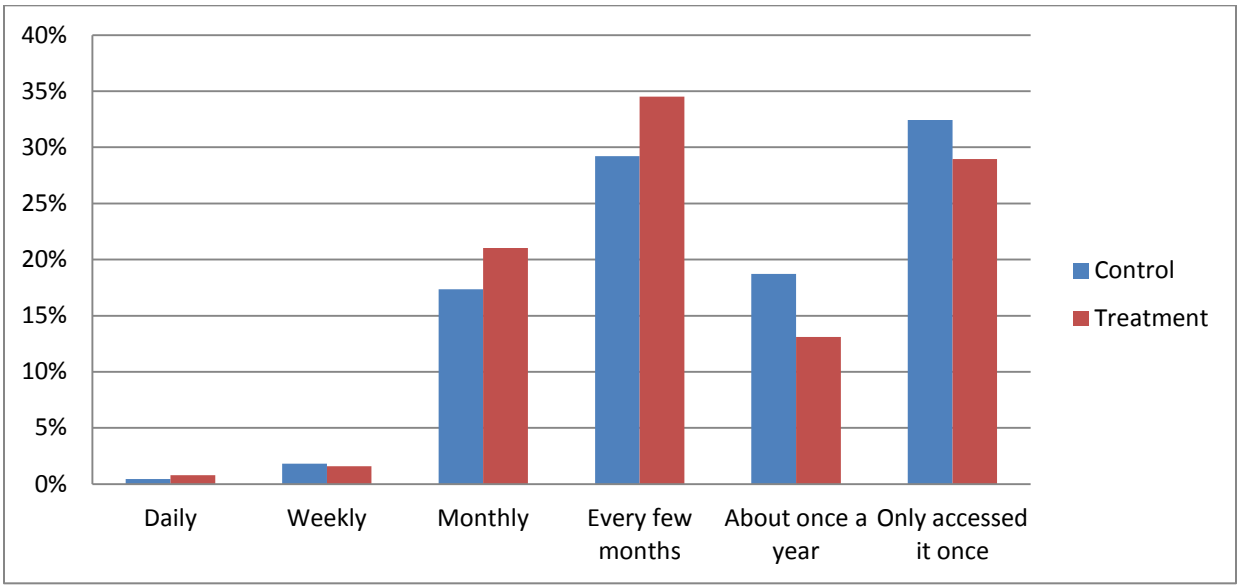
Figure B-1: "When was the last time you viewed your energy use on the Avista Website using the Energy Analyzer?" n = 645



A smaller percent of treatment customers reported not ever visiting the website (but only significantly so at the 10% level). The chi-square test indicates that the treatment customers reports of the last time Energy Analyzer was viewed is statistically different than that reported by the control customers (p-value = 0.025); treatment customers reported viewing the site less recently than the control customers.

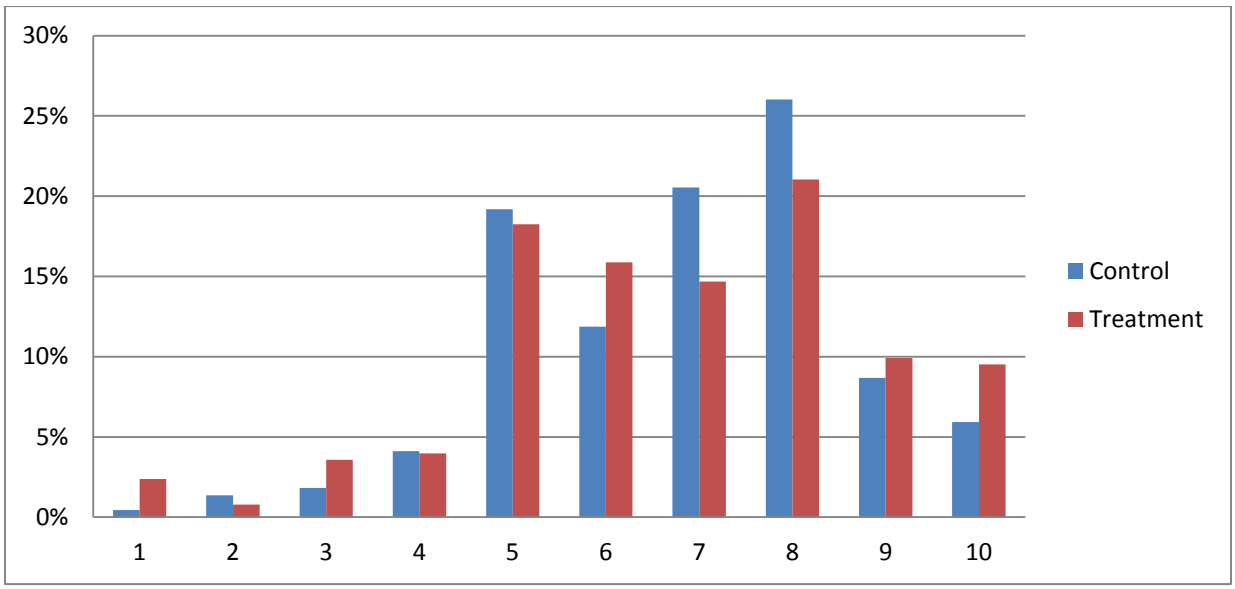
Those respondents who indicated that they have used the Energy Analyzer feature (471) were asked how often they use it; responses to this question are shown in Figure B-2. 102 (21%) of respondents reported using the Energy Analyzer at least once a month. 31% of respondents say they have only used the Energy Analyzer once, leaving the remaining 48% of respondents who use the Energy Analyzer every few months or once a year.

Figure B-2: "About how often would you say you use the Energy Analyzer on the Avista website?" n = 471



When asked about their overall impression about the Energy Analyzer, respondents mostly reported that they moderately "like" the Energy Analyzer. Responses to this question are shown in Figure B-3. While 17% of respondents gave the Energy Analyzer the top or second-top likeability score, 55% of respondents gave a likeability score between 6 and 8.

Figure B-3: "What is your overall impression of the Energy Analyzer web page? 1 = "do not like," 10 = "like very much" n = 471



When asked further about the usefulness of the information presented by the Energy Analyzer, 66% of respondents gave a score of 6 or higher, but the Energy Analyzer scored better on usefulness for saving energy than likability – 24% of customers gave the Energy Analyzer the top or second-top usefulness score. Responses to this question are presented in Figure B-4.

Figure B-4: "The Energy Analyzer web page supplies information that is useful for identifying energy savings opportunities." 1 = "strongly disagree," 10 = "strongly agree" n = 471

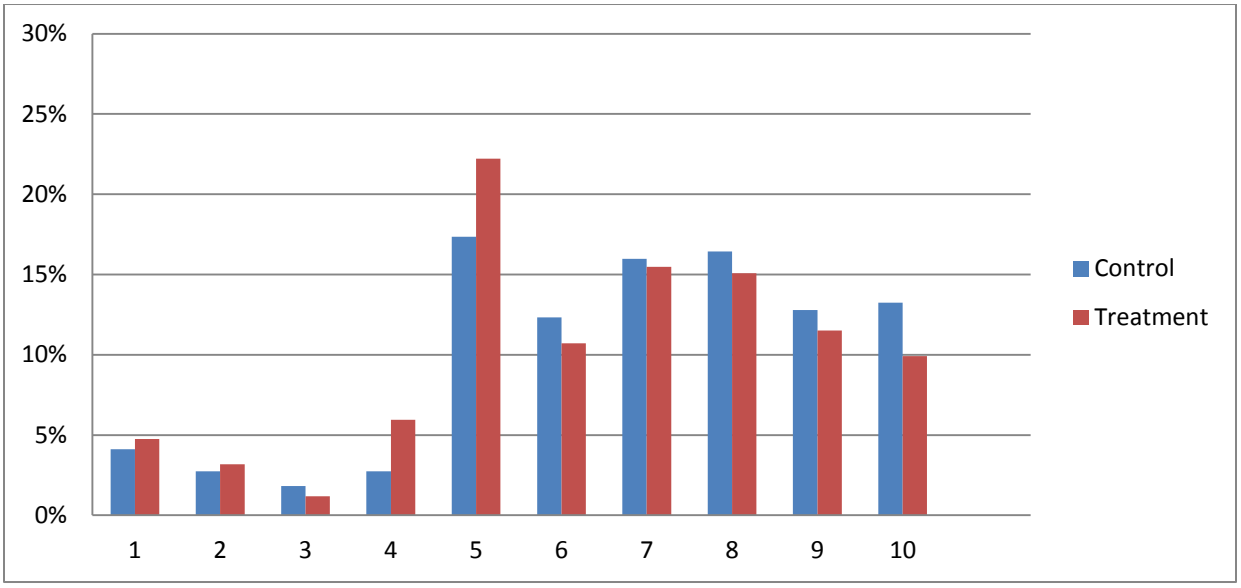


Figure B-5 shows that 74% of customers would agree with the statement that the Energy Analyzer information is easy to understand, while 29% of respondents give strong agreement scores of 9 or 10.

Figure B-5: "The Energy Analyzer web page supplies information that is easy to navigate, read and/or understand." 1 = "strongly disagree," 10 = "strongly agree" n = 471

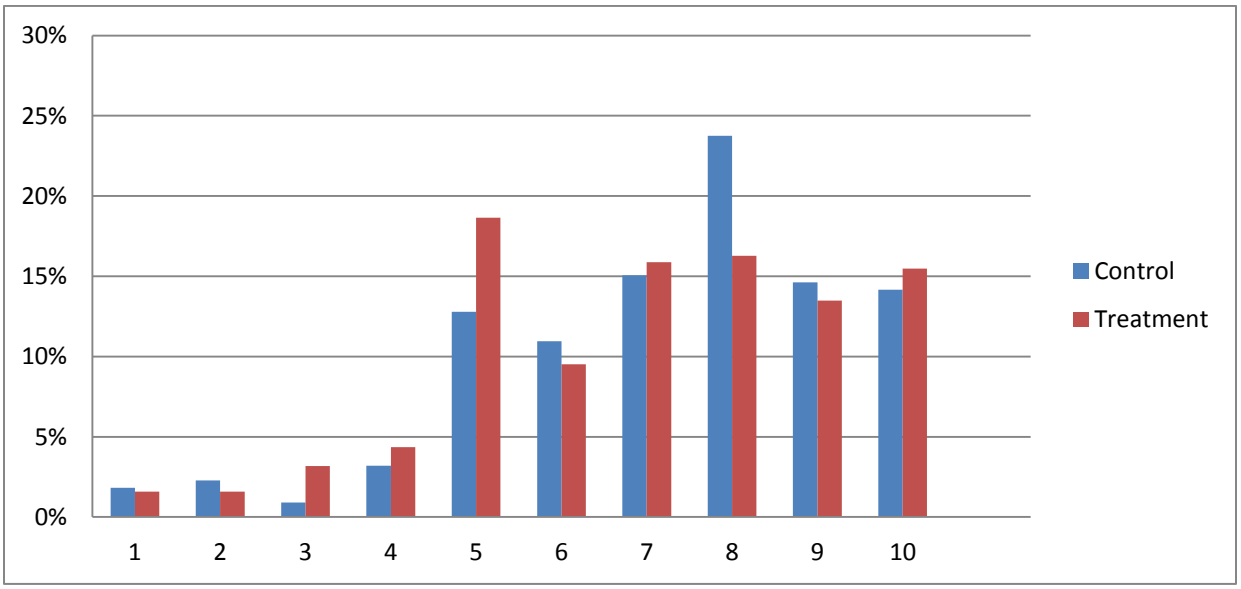
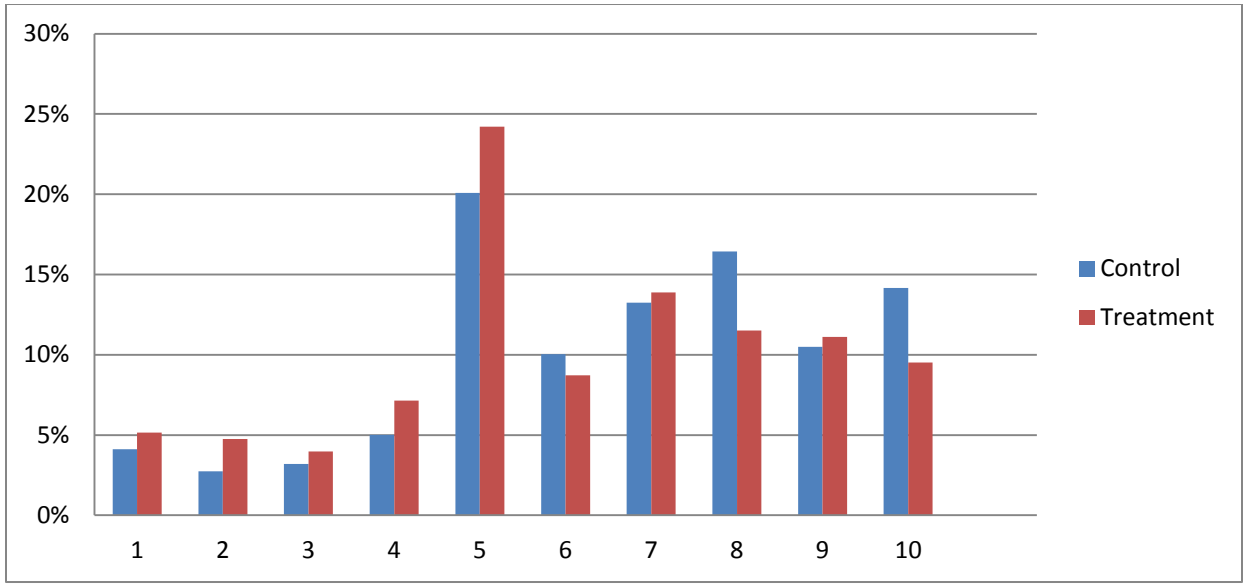


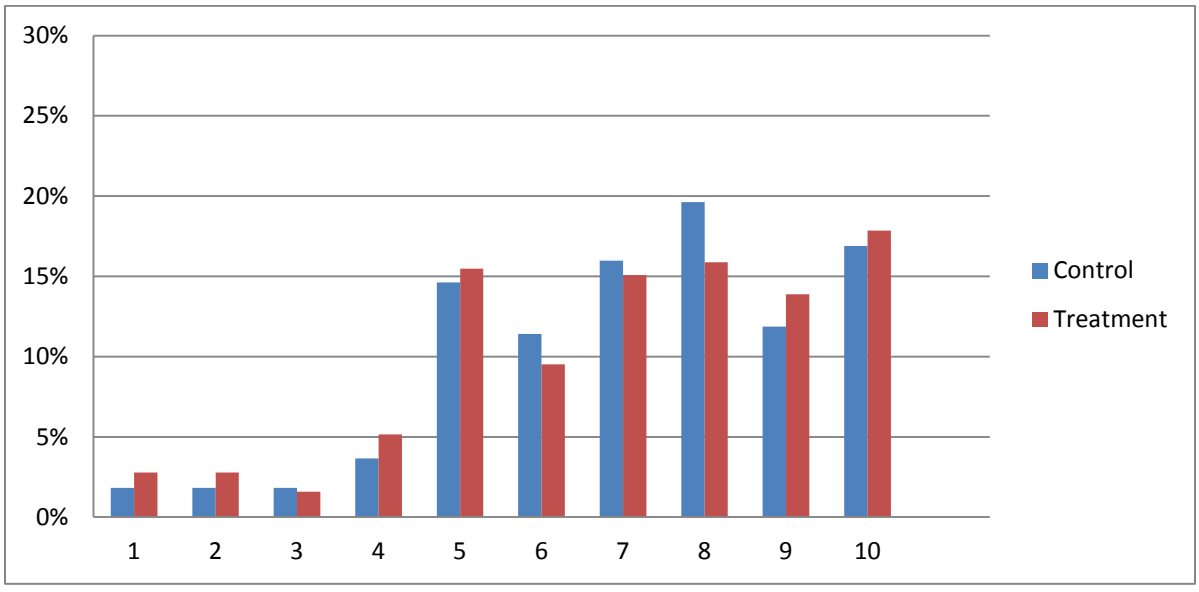
Figure B-6 shows responses to the question of whether or not respondents agree with the statement that they would recommend the Energy Analyzer to their friends and neighbors. Here, 60% of customers give an agreement score of 6 or higher, and 22% of customers in particular give an agreement score of 5.

Figure B-6: "The Energy Analyzer web page is something that I would recommend to my friends and neighbors." 1 = "strongly disagree," 10 = "strongly agree" n = 471



Respondents were also asked how well they agree with the statement that the Energy Analyzer is easy to use; responses to this question are shown in Figure B-7. Most customers, 74% agree, giving a score of 6 or higher.

**Figure B-7: "The Energy Analyzer web page is easy to use."
1 = "strongly disagree," 10 = "strongly agree" n = 471**



In contrast to the question about the Energy Analyzer's usefulness for identifying energy savings opportunities, Figure B-8 shows that respondents were not as successful with getting the household to better control energy use. Only 51% give an agreement score of 6 or higher and 24% give a score of 5. A similar pattern emerges in Figure B-9, which shows responses to the question of whether the Energy Analyzer gets the household more interested in controlling energy use. Here, 22% gave an agreement score of 5, while 54% gave a score of 6 or higher.

Figure B-8: "The Energy Analyzer web page has made my family/household more able to control our energy use." 1 = "strongly disagree," 10 = "strongly agree" n = 471

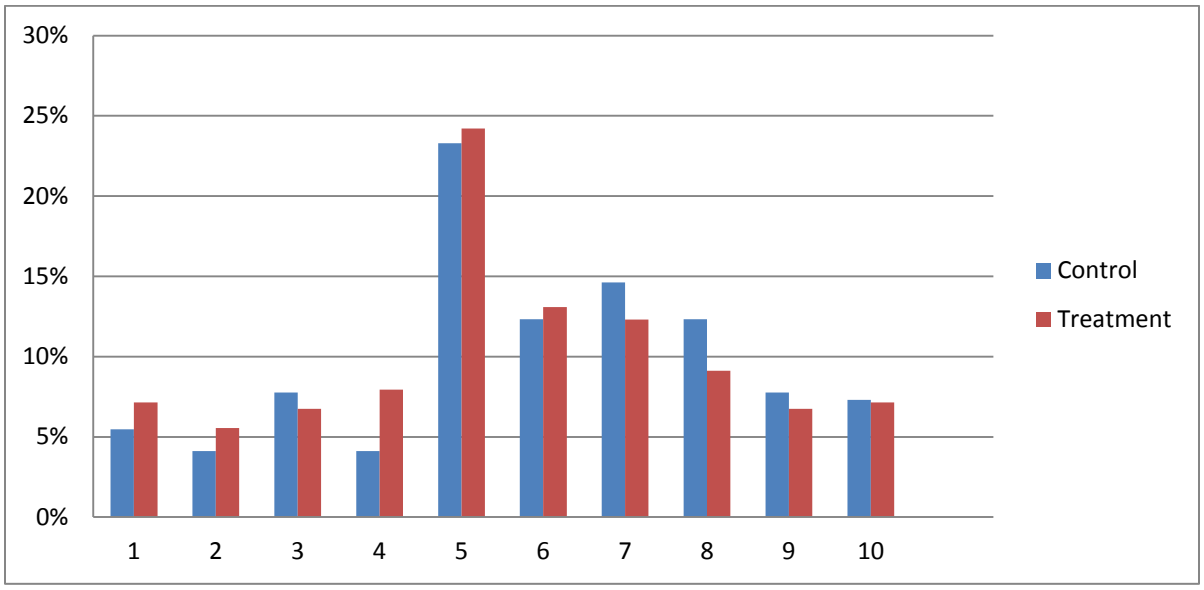


Figure B-9: "The Energy Analyzer web page has made my family/household more interested in controlling our energy use." 1 = "strongly disagree," 10 = "strongly agree" n = 471

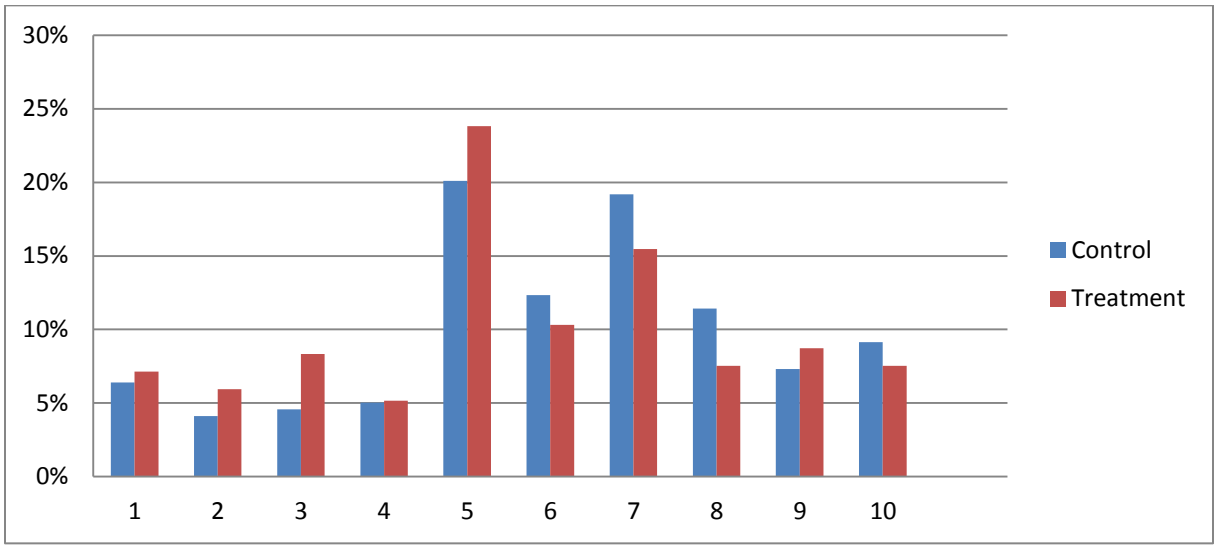
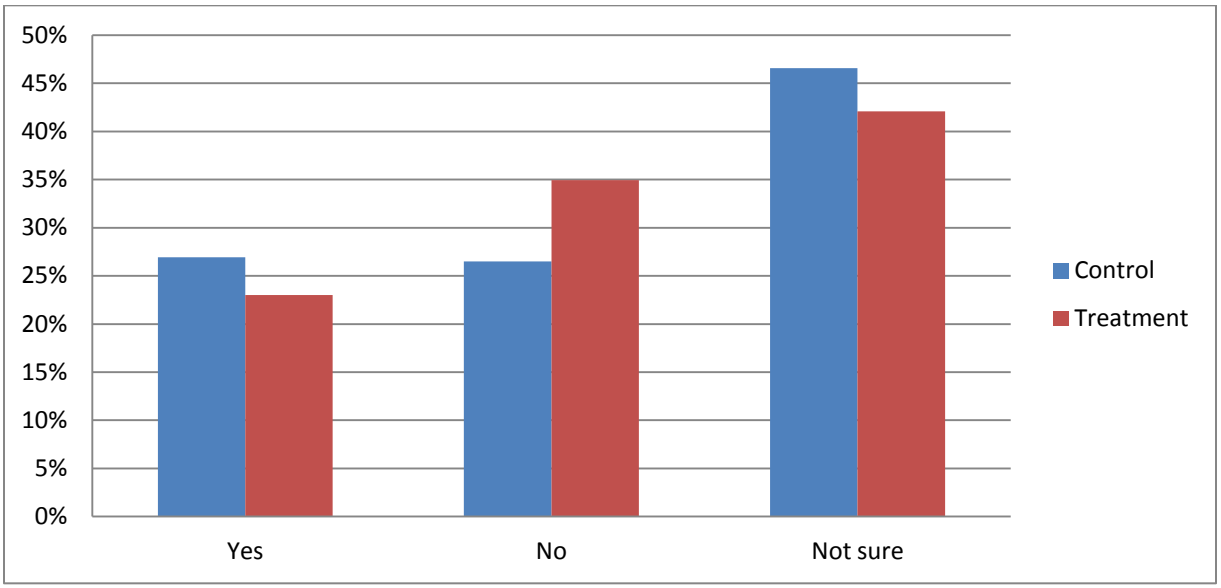


Figure B-10 presents responses to the question of whether the respondent believes that they have used less energy as a result of seeing the information presented by the Energy Analyzer. 25% responded in the affirmative, with the remainder stating "No" or "Not sure."

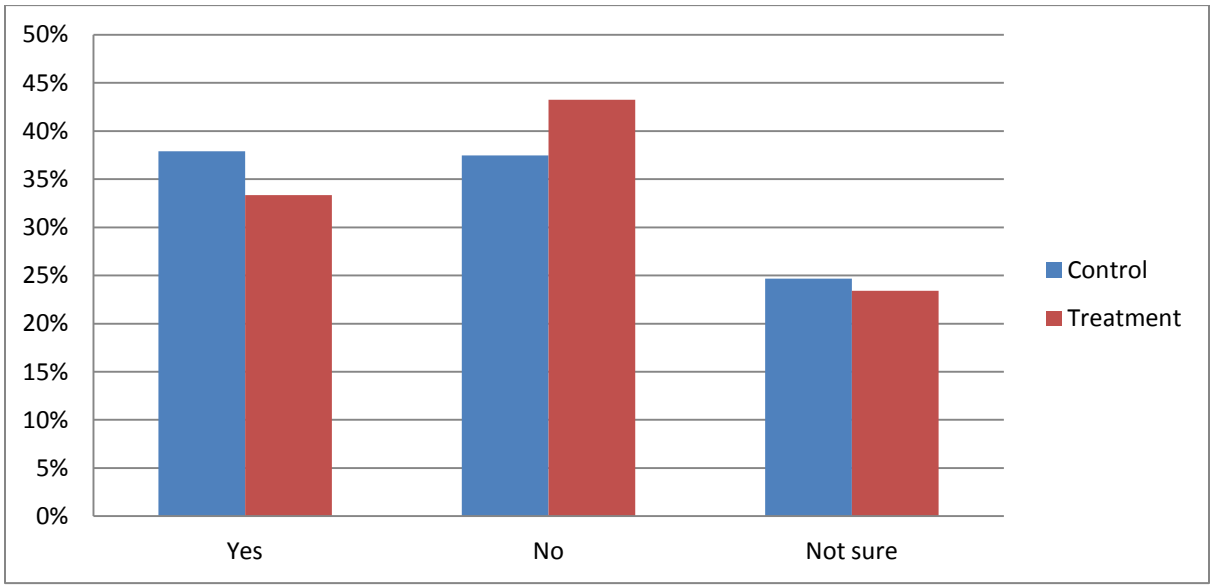
Figure B-10: "Do you believe that you have reduced your energy use as a result of viewing the information on the Energy Analyzer?" n = 471



B.2 Behavioral Changes Due to Using the Energy Analyzer

Respondents were asked about whether they made any changes in the way they have used electricity based on information presented by the Energy Analyzer; responses to this question are shown in Figure B-11. 35% of respondents report that they had, while 65% of respondents reported that they did not or were not sure. There were no significant differences in the response to this question between treatment and control customers.

Figure B-11: "Have you made any changes to the way you use electricity in your home based on the information provided by the Energy Analyzer?" n = 471



B.3 Customer Perceptions of and Satisfaction With Avista Services

Respondents of the final survey were also asked three questions about perceptions of and satisfaction with Avista services. None of these questions yielded responses that differed between treatment and control customers.

Figure B-12 presents results to the question of the likelihood of the respondent taking advantage of Avista-sponsored energy efficiency programs. 10% of customers said that they didn't know, but 75% of the remaining respondents stated that they would be likely to take advantage of such programs. The final survey next inquired as to the respondent's satisfaction with Avista. Eighteen respondents refused to answer, however 48% of the remaining respondents gave Avista the top or second-top satisfaction scores. Only 3% of respondents replied with scores in the "dissatisfied" portion of the response spectrum. Finally, the survey asked about the importance of saving energy to the respondent. 70% of respondents stated that saving energy is important to them.

Figure B-12: "How likely are you to take advantage of Avista-sponsored energy efficiency programs (such as rebates) if you heard about any programs that were designed for people like you? Are you…" n = 1,006

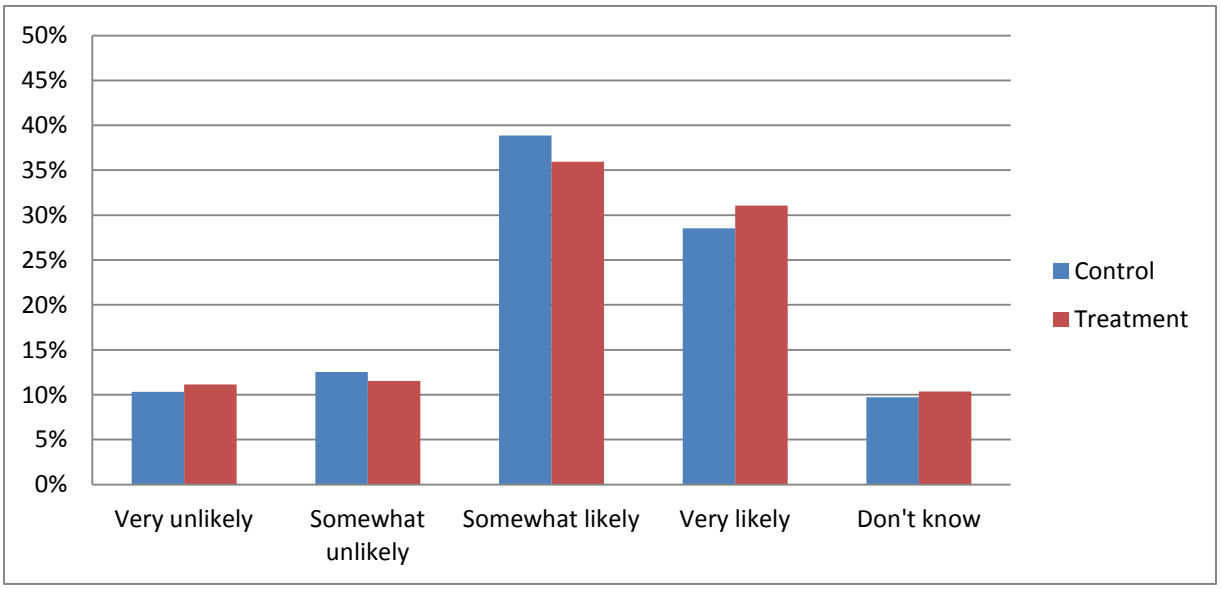


**Figure B-13: "Using a 10-point scale where 1 means "completely dissatisfied" and 10 means "completely satisfied," how would you rate your overall satisfaction with Avista?"
1 = "completely dissatisfied," 10 = "completely satisfied" n = 1,006**

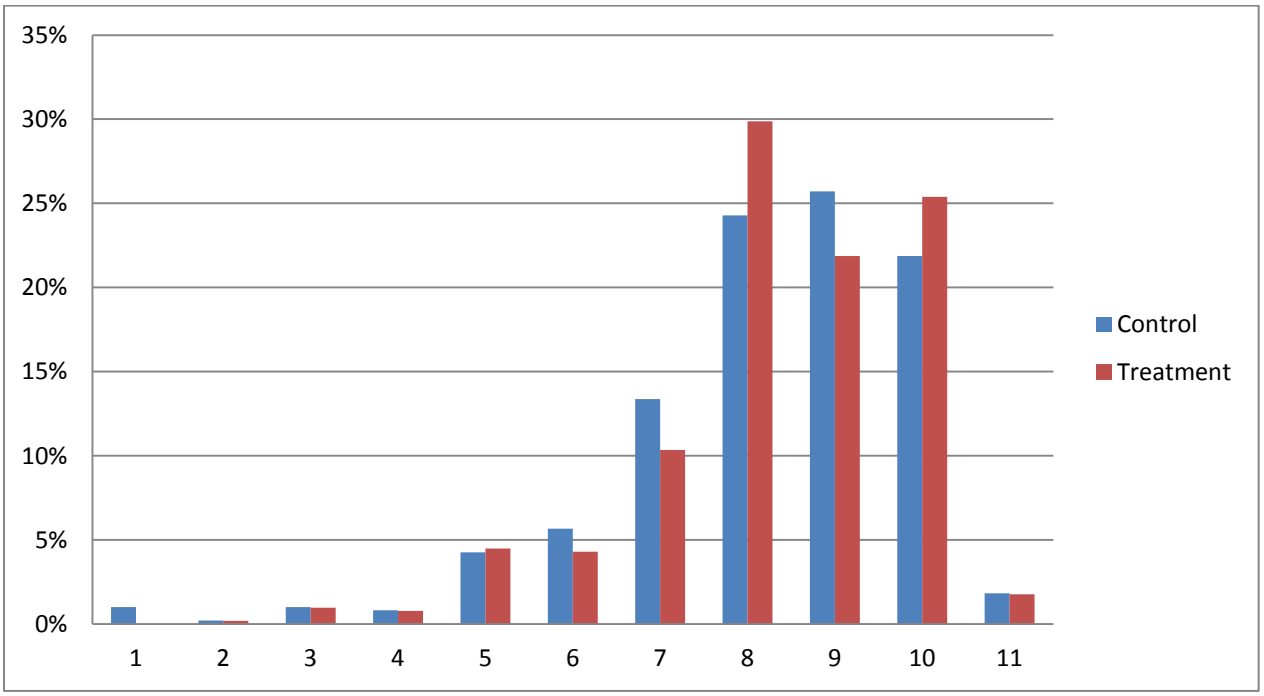
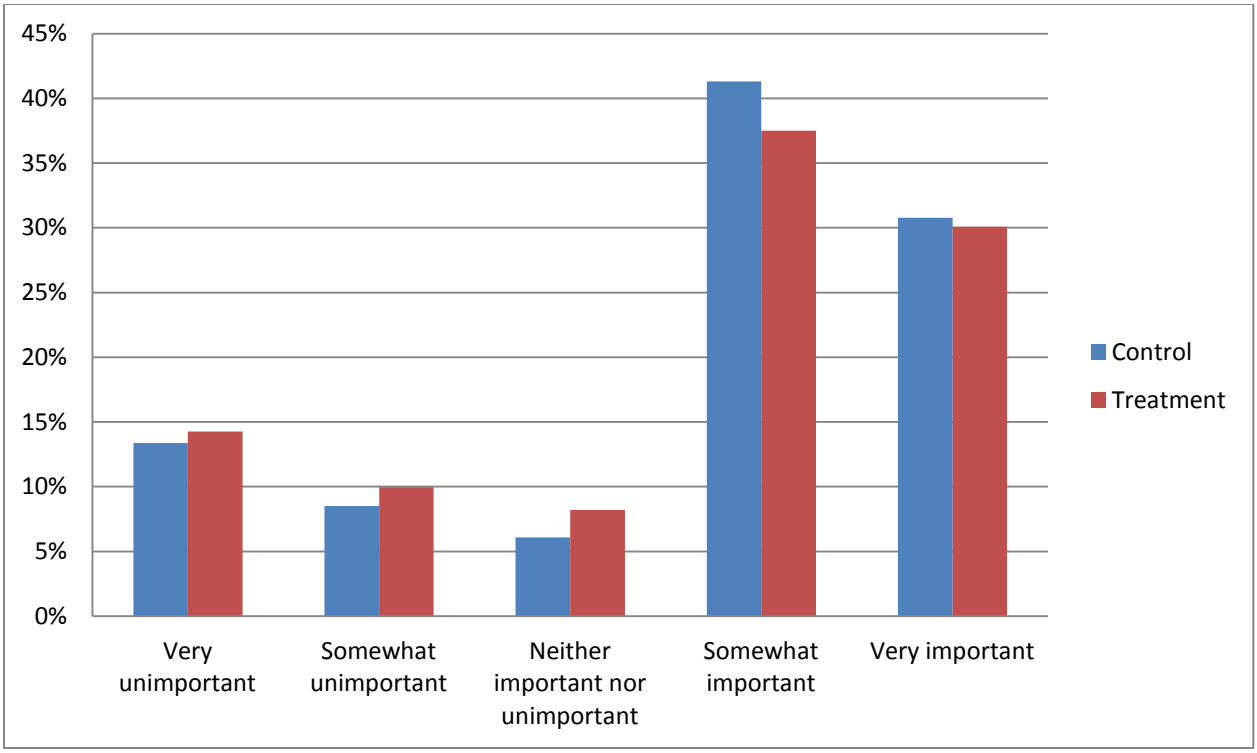


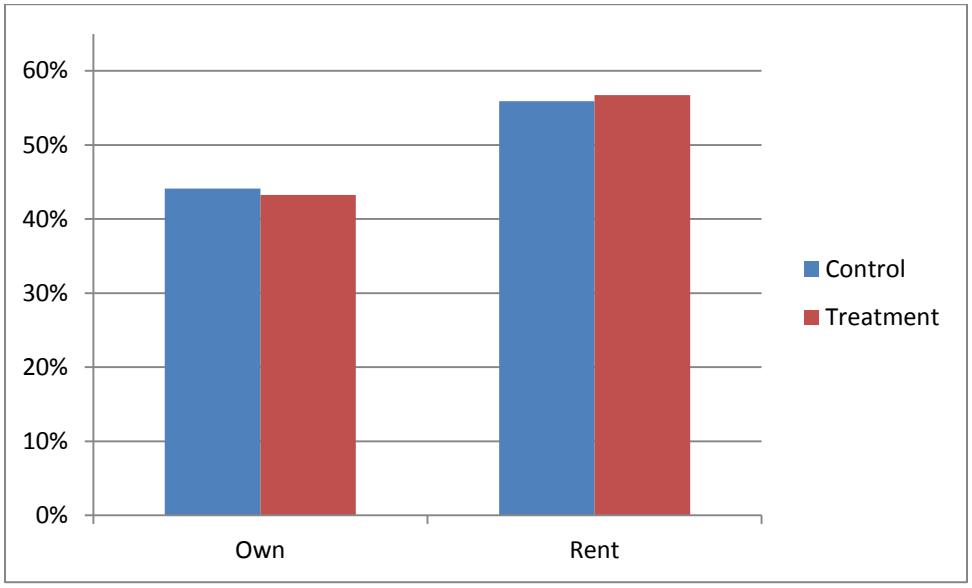
**Figure B-14: "In general, how important is reducing your home energy use to you? Is it…"
n = 1,006**

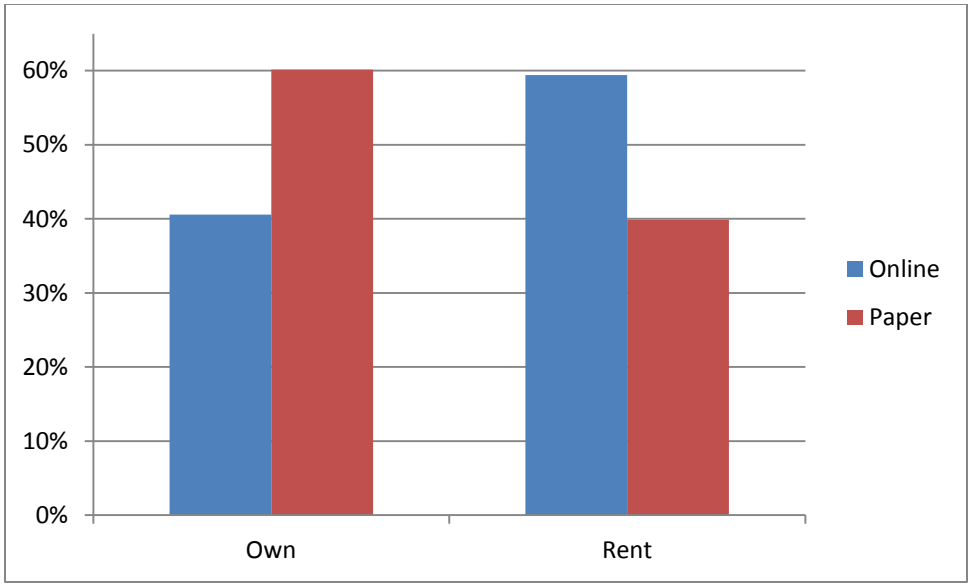


B.4 Comparisons of Responses to Demographic Questions

Only one statistically significant difference in responses to demographic questions were found between treatment and control customers responding to the final survey, which may be attributed to random chance due to the number of questions asked of respondents and reported on here. A number of differences in responses to demographic questions were found between respondents of the online survey and those who completed the paper survey. These differences are typical and expected and illustrate the importance of mix-mode customer contact protocols for market research. Responses to the demographic questions of the final survey are shown in Figures B-15 through B-21.

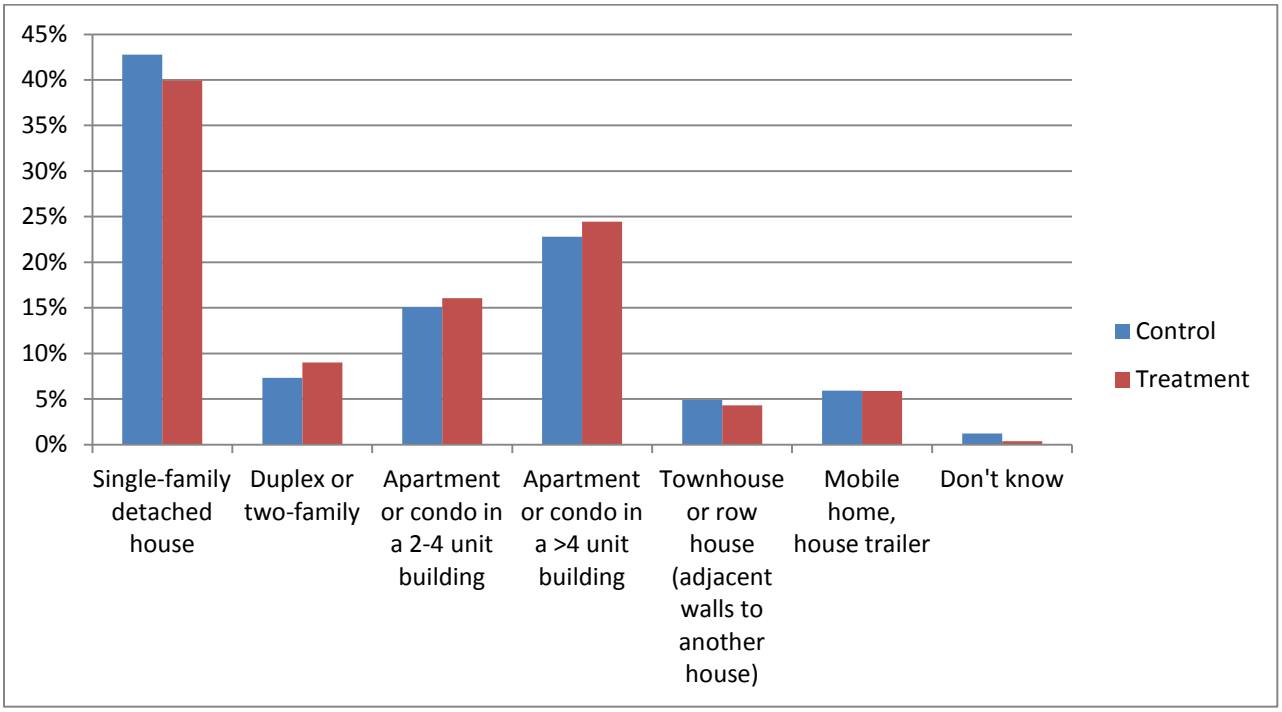
Figure B-15: "Do you own or rent your home?" n = 1,003

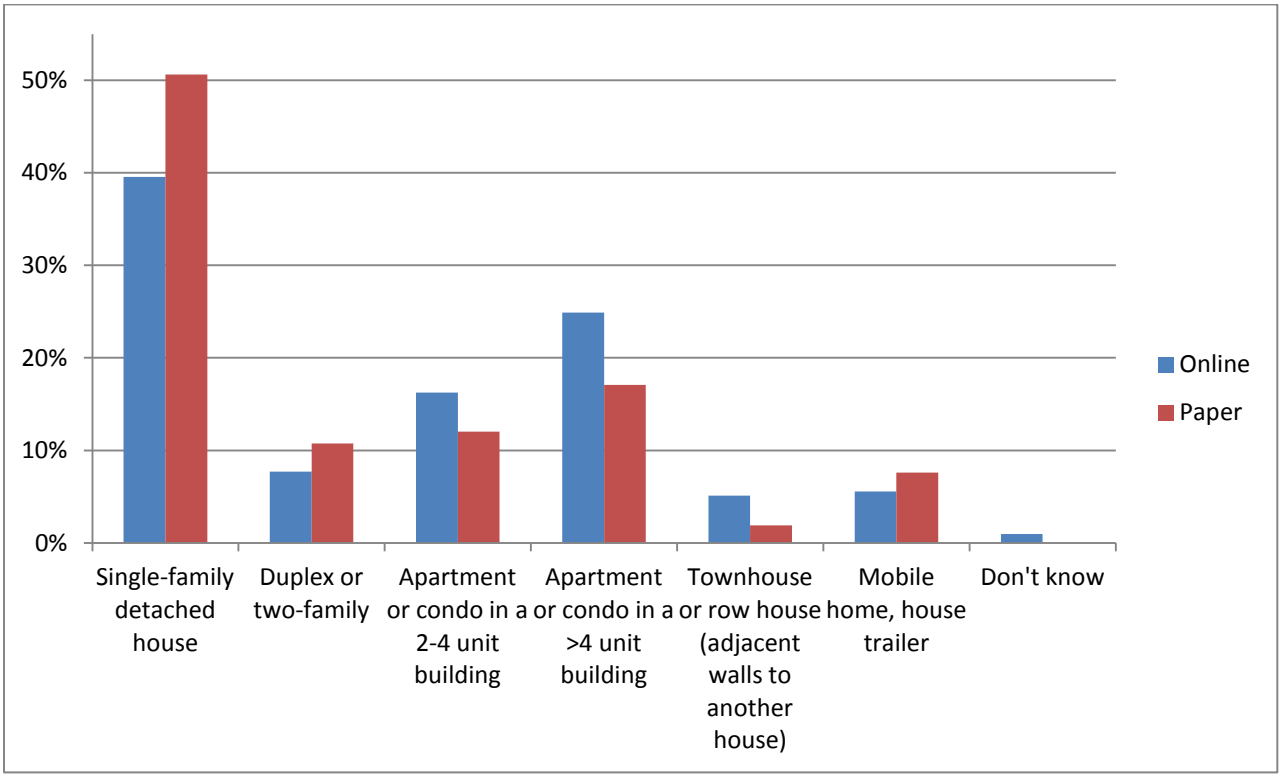




Customers who completed the paper survey are significantly more likely than those who completed the online survey to own their home.

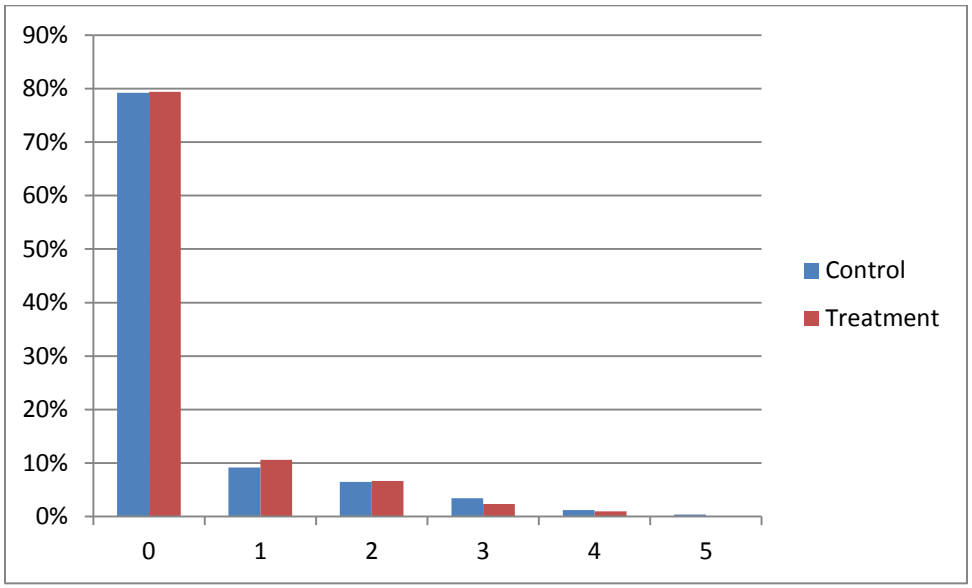
Figure B-16: "What type of structure is this residence? Is it a…" n = 1,002





Customers who completed the paper survey are more likely than those who completed the online survey to live in a single-family detached home.

Figure B-17: "Please indicate the number of persons in each age category that currently reside in your home: Children under 18." n = 1,001



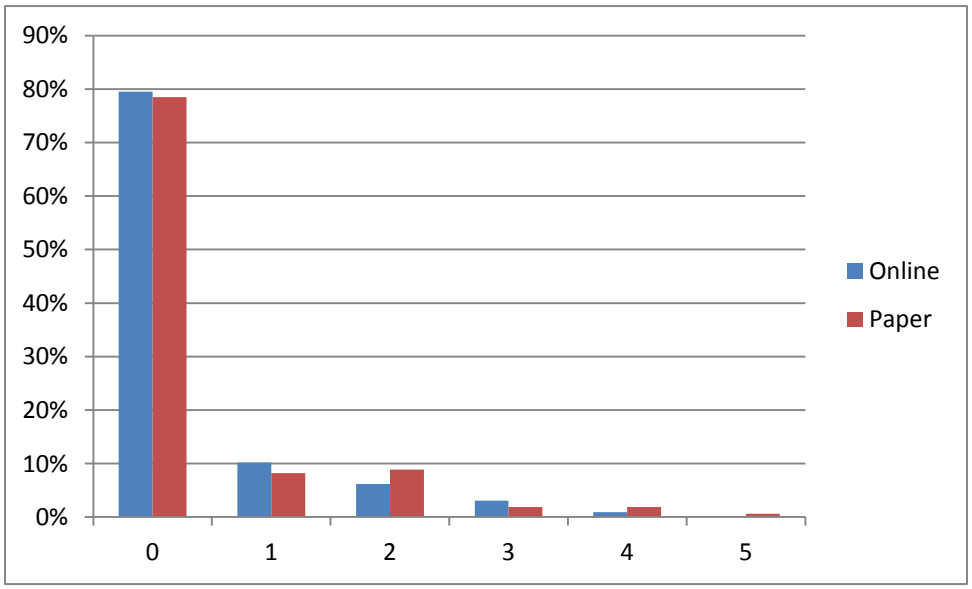
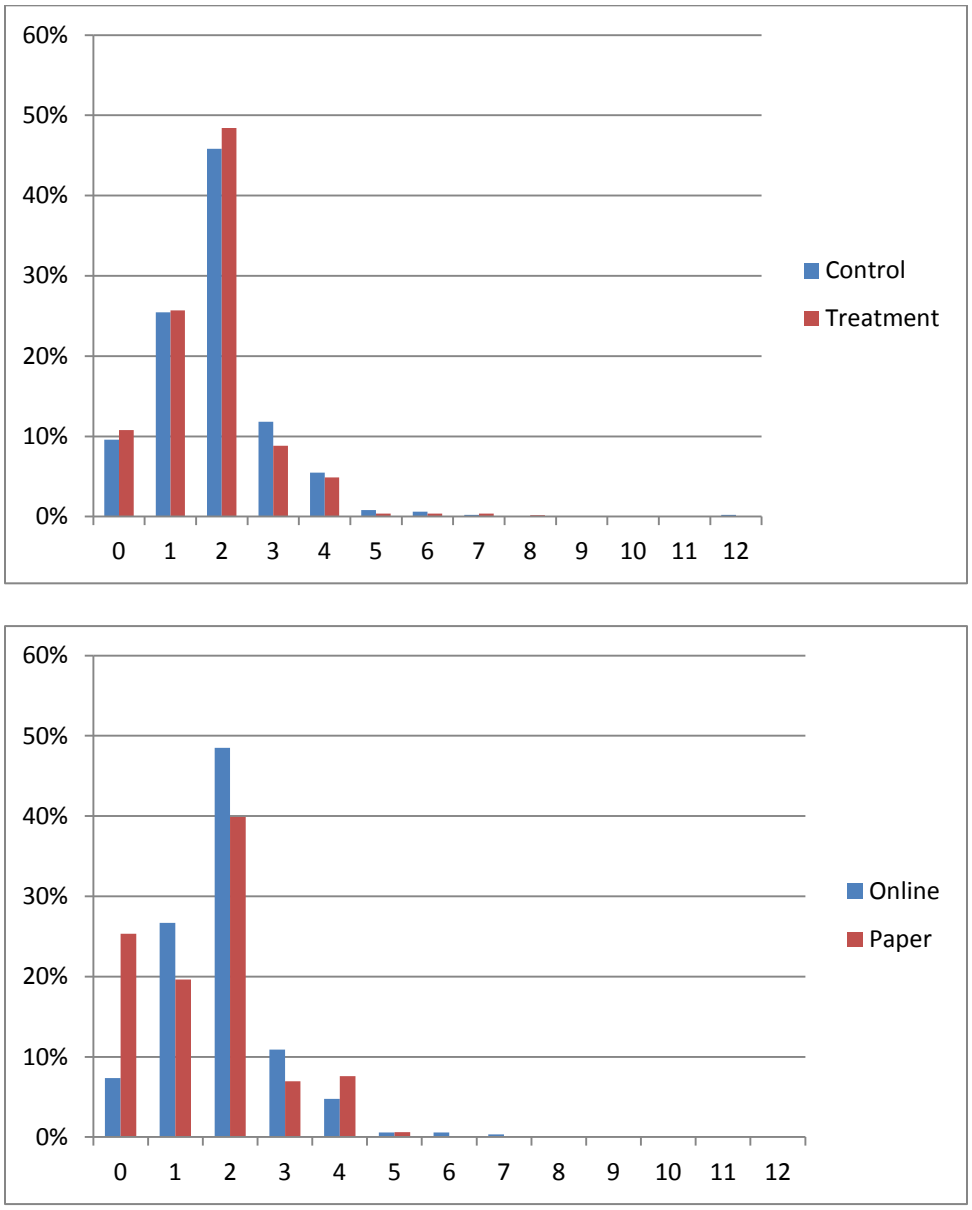
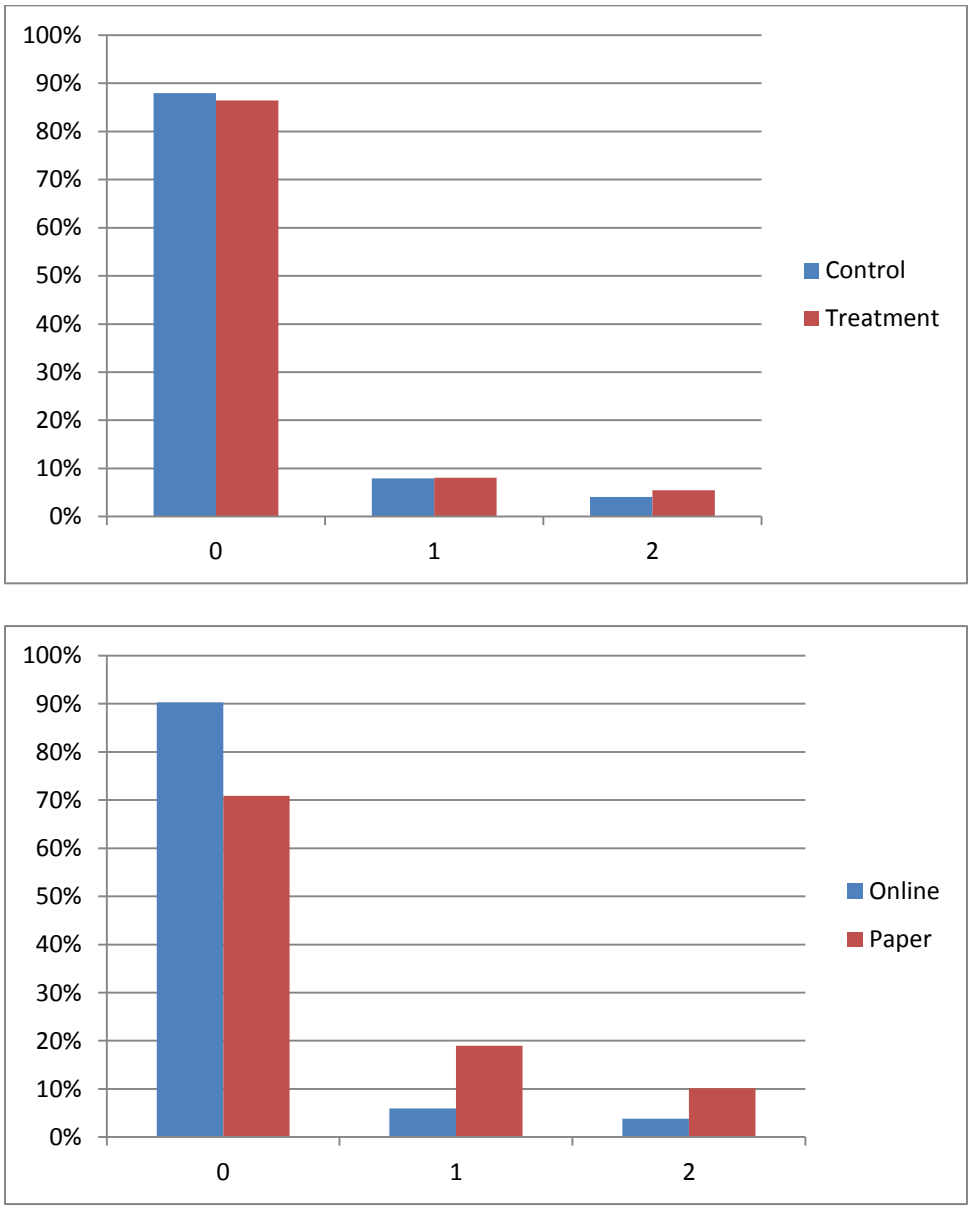


Figure B-18: "Please indicate the number of persons in each age category that currently reside in your home: Adults 18-64." n = 1,001



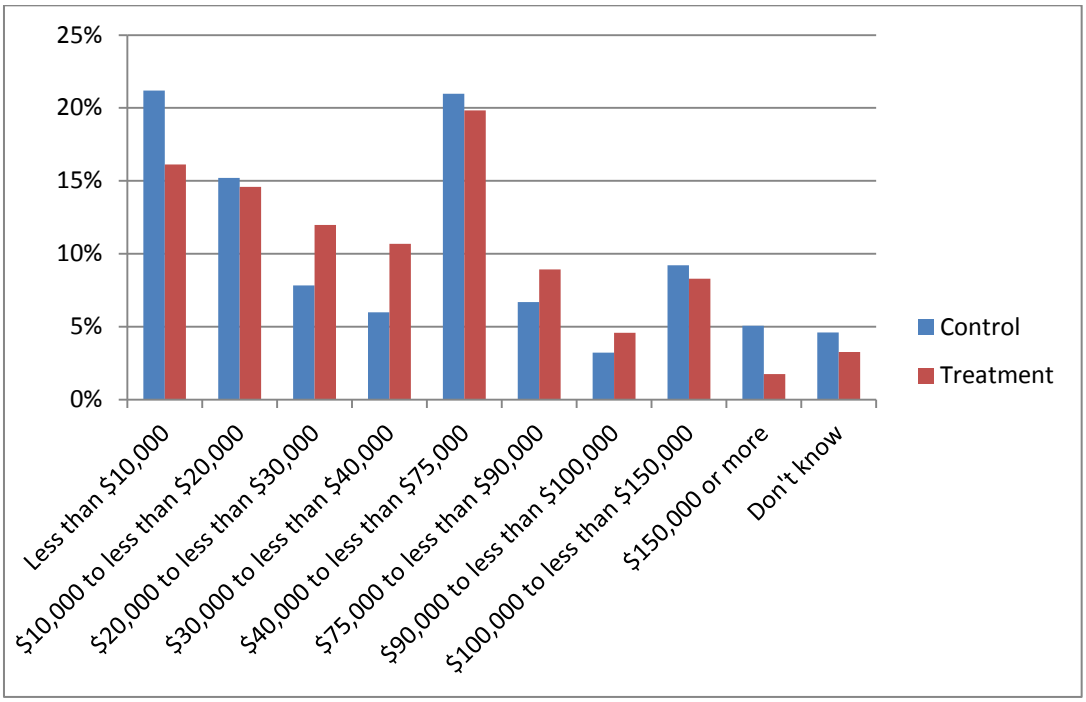
Customers who completed the paper survey have significantly more adults over the age of 64 residing in their home than the customers who completed the online survey.

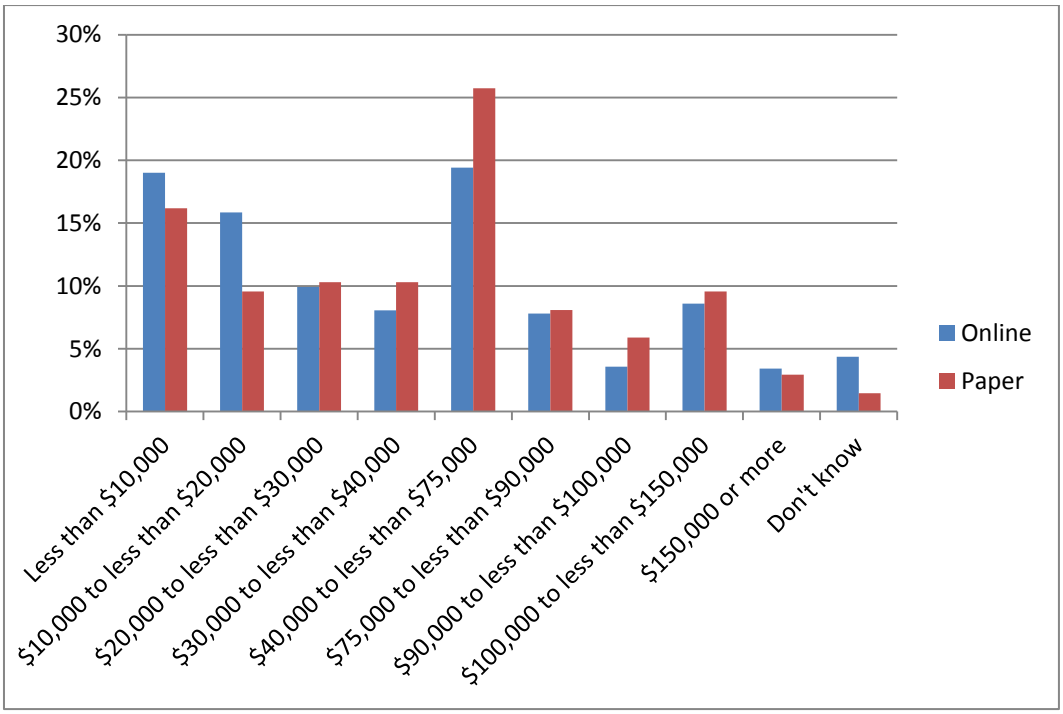
Figure B-19: "Please indicate the number of persons in each age category that currently reside in your home: Adults 65 and over." n = 1,001



Customers who completed the paper survey have significantly more adults over the age of 64 residing in their home than the customers who completed the online survey.

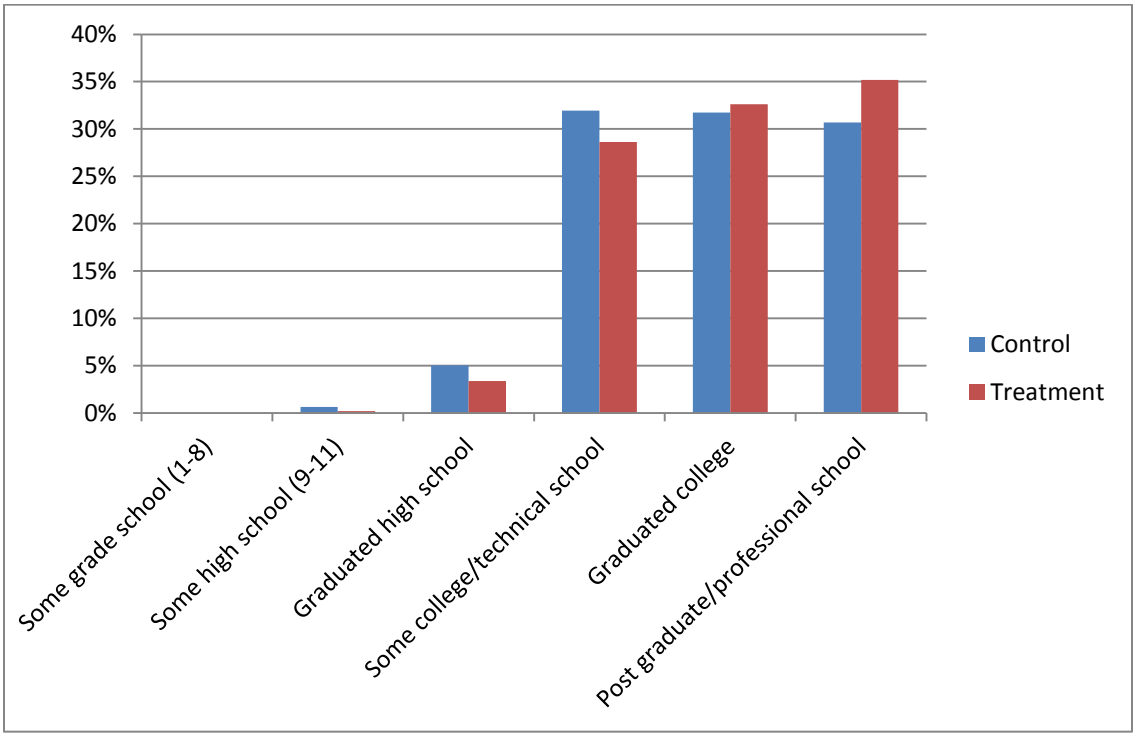
Figure B-20: "Which of the following income categories best describes your total household income for 2012 from all sources before taxes?" n = 893

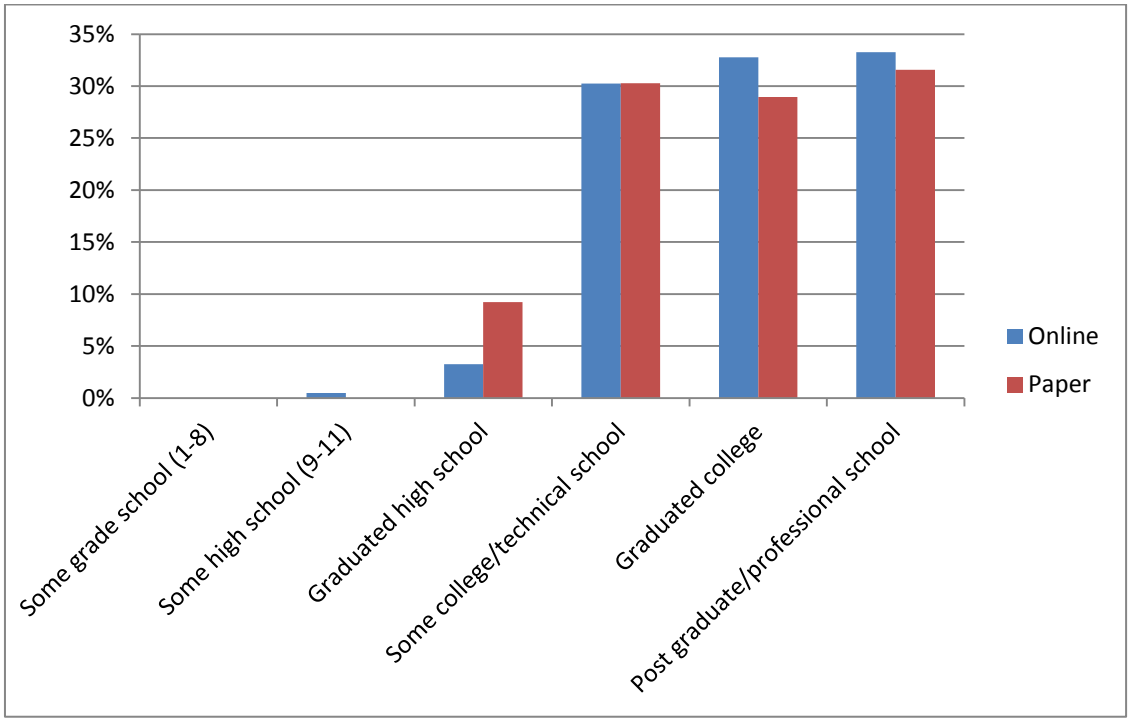




The chi-squared test revealed there is a significant difference (p=0.004) in the income distributions of the households in the treatment and control groups – more control group respondents earn less than $10,000 per annum than treatment group respondents.

Figure B-21: "What is the highest level of education you have completed so far?" n = 982





Customers who completed the paper survey have completed significantly less education than the customers who completed the online survey.

Appendix C Website Examples

Figures C-1 through C-3 illustrate the current use of the right-hand side of popular webpages for advertising or marketing content. Advertising content is highlighted in the figures with a red box.

Figure C-1: Yahoo! Screenshot

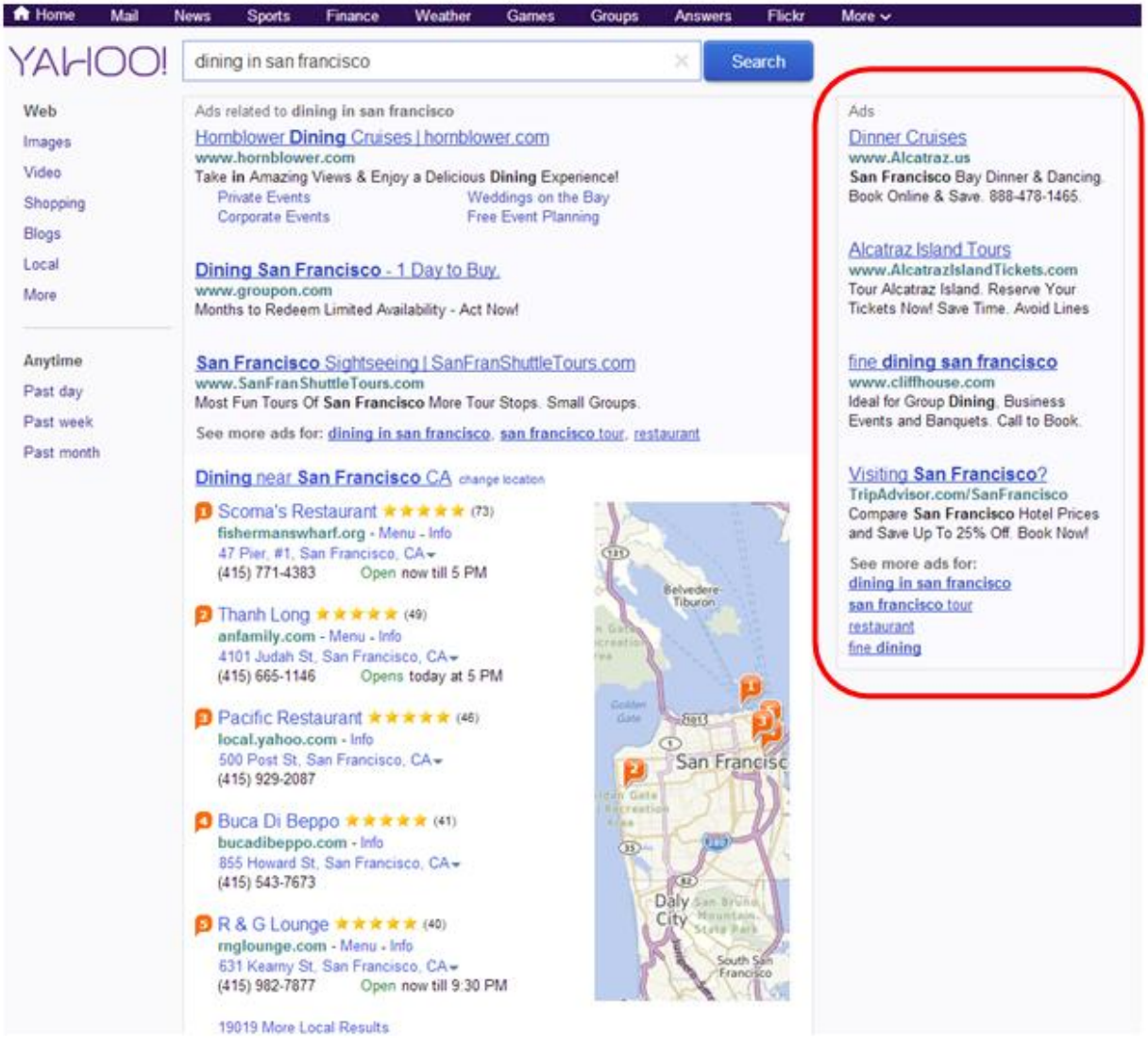


Figure C-2: Google Screenshot

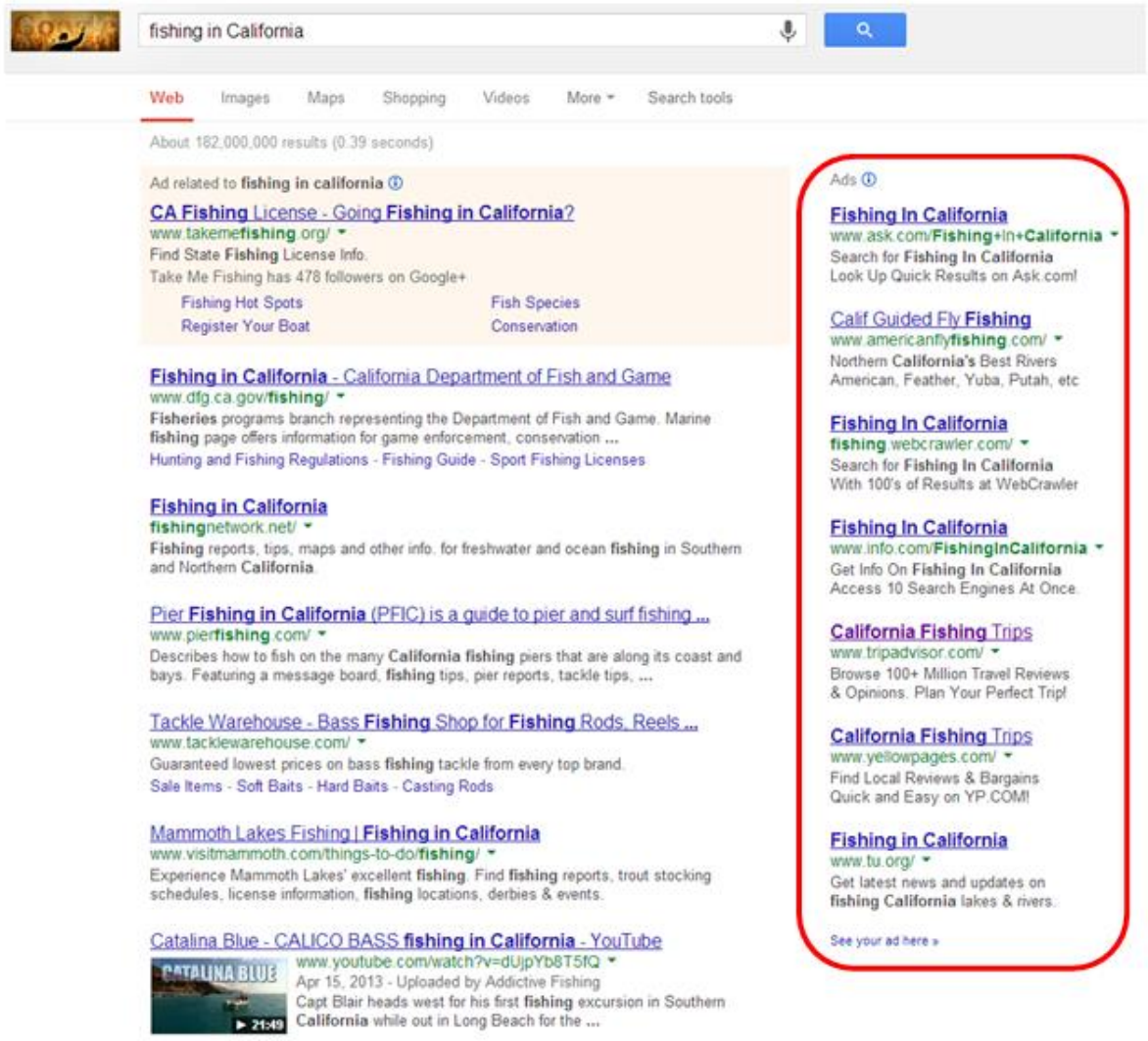


Figure C-3: Facebook Screenshot